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JOURNAL OF EDUCATIONAL RESEARCH

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CUMULATIVE RECORDS FOR RESEARCH PURPOSES

CHARLES D. FLORY
Lawrence College

THE indigenous teacher who boarded around had little need for an elaborate records system. He knew the academic, social, and physical characteristics of every child in the community. He knew the parents and grandparents; he knew the brothers and sisters; he knew the environment and its influences. Johnny who was exceedingly tall for his age was never considered an abnormal child for his father and his grandfather before him were both more than six feet in stature.

Urbanization of the population, consolidation of schools, and departmentalization of instruction created a demand for records which would properly account for the juvenile population in the community. No one person or staff of school employees could any longer hold in mind from year to year all of the necessary facts about the pupils enrolled. The school census was established to determine how many children were eligible for school work. Records were devised to assist in dealing with those children who were entering school for the first time as well as those who had been enrolled during previous years. Child accounting, in the early days was concerned chiefly with the register, attendance, passes and failures, and withdrawals or dismissals from school. Many facts were recorded but little attempt was made to determine the significance of the data. A study[1] by Snedden and Allen in 1906 reports the attitude of a New York school official toward a practical problem:

"*Undoubtedly* the chief cause (for students dropping out of school) is that many leave to go to work. *Probably* in the majority of cases the necessity of earning more money is the controlling motive. Such students *generally* take supplementary courses in the evening high schools, others . . . leave . . . because of that restlessness of mind which comes to all students at the period of adolescence and which is particularly marked amid the excitements of a large city."

[1]Editorial, *Junior and Senior High School Clearing House*, IV (March, 1930), p. 386.

Even though records were available this school officer resorted to speculation—undoubtedly—probably—generally—rather than investigation. Research distinguishes between opinion and guesses on the one hand and measurable definable conditions on the other.

Records taking was in such a chaotic state in public schools that the Department of Superintendents appointed a committee in 1910 to bring recommendations for a system of uniform records. A report was submitted at the St. Louis meeting in 1912 at which time 216 cities had already adopted the major recommendations of the committee. This move on the part of a group of public school officials improved records taking practices but did not provide an adequate records system for research purposes.

The scientific movement in education had made considerable progress before school records were of much value for research. Measurements of physical differences in children, intelligence test scores, differences in social and emotional qualities, and the re-evaluation of the child as an individual brought research possibilities from school records. The research laboratory organized at Vineland in 1906 seems to be the first attempt to conduct systematic research from school and mental test records. Abnormal children received considerable attention before systematic attempts were made to utilize continuous school records for investigating developmental problems of normal and superior children. As late as 1925 the cumulative records system of a large city[2] was so incomplete that the school progress of less than 60 percent of the pupils could be followed. If large cities which have kept records for many years have such meager data, it is easy to understand the reasons for a scarcity of investigations based upon school records.

Studies in child development at the University of Iowa, the Harvard growth studies, and the University of Chicago Laboratory Schools records system have been in continuous operation for more than a decade. Child development centers in many places have launched programs of repeated measurements for purposes of research. These activities in university and other child development centers have spread to some extent into the public schools. There is, however, no wide-spread acceptance of the research values of cumulative records by elementary and secondary public school officials.

In 1928 the American Council on Education undertook to demonstrate to secondary and higher institutions the need for a cumulative

[2]Editorial, *Elementary School Journal*, XXVII (October, 1926), pp. 82-84.

records system. This effort on the part of the American Council on Education has done much to keep the problem before school people. Such movements are certainly in the right direction. Constant stimulation is necessary if an adequate system of records for research purposes is to be developed and employed. When administrators fully realize that the development of the smallest unit of the school—the child—constitutes problems which must be faced by the entire staff, then an adequate records system and profitable research activities will find a larger place in the educational program. At present, long time research programs from cumulative records may have to be confined chiefly to experimental schools in university centers or to subsidized child development agencies in large urban areas. The remainder of this discussion will assume that adequate facilities are available. Some problems of policy and procedure will be the emphasis in subsequent considerations.

INTEGRATED RECORDS SYSTEM OR A RESEARCH LABORATORY

Records in the usual school are kept for administrative and instructional purposes. A research emphasis in the school soon reveals that the average recording devices are quite inadequate for comprehensive research work. The experimentalist may solve his problems by establishing a laboratory of his own in which records desired for specific investigations are assembled. There is little doubt that such a procedure can be made effective but one can be equally as certain that divorcement from regular school situations produces an abnormal relationship between research and other educational functions. A records system for administrative, guidance, and instructional purposes when expanded to meet the needs of research workers reduces the amount of duplication in clerical work and provides both the administrator and the investigator with a more complete picture of the child. Making a records system an integral part of the school avoids the danger of encroaching too heavily upon the pupil's time. After all, children are in school to learn, to adjust, and to mature; they have not enrolled in our schools merely to serve as subjects for scientists.

Objectives of an integrated records system.—There are certain objectives to be attained by the accumulation and interpretation of information when a records system has been made an integral part of the school system. Every part of a good school exists first to improve the services to the child. Records should be kept with the ultimate objective of benefits for pupils. Administrators need information of definite types to enable them to serve the school competently. An adequate sys-

tem of records serves the administrator to very good advantage. A complete picture of each pupil makes it possible to integrate the educational program through a knowledge of the essential unit in the system—the child himself. Finally, a satisfactory system of records makes it possible to advance the scientific study of children by developing standards and by constant evaluations through research channels. These three objectives: the needs of the child, the needs of the administrator, and the needs of research should guide in the inauguration and continuation of a records system which will be adequate without being burdensome, complete without being unwieldy, and productive without being extravagant.

CROSS-SECTION OR LONGITUDINAL STUDIES

It is likely unnecessary to comment on the superiority of the longitudinal view over the cross-section or mass view of growing children. Most institutions have accepted the idea of cumulative records, whether the purpose is diagnostic, remedial, or experimental. Status of a group can be determined with little difficulty. Trends in the development of a given population with respect to certain traits can be obtained by determining the status of successive age groups throughout the growth period. Yet, few individuals follow the pattern indicated by a study of mass data. If the population studied is a public school group, constant selection from age to age changes the characteristics of the sample and especially during the adolescent years. Certain aspects of growth in the individual have not reached maturity at the time of high school graduation. Thus, a sample of college freshmen is likely to be growing physically but these physical changes cannot be compared directly with measurements of high school seniors. The proper way to control this problem of selection in school populations is to accumulate a series of data by repeated measurements on the same individuals. A longitudinal view of individuals makes it possible to obtain a developmental view of the group to which these individuals belong. Children used in a longitudinal study may be accelerated, average, or retarded but the interpretations can be made in the light of the characteristics of the group as a whole.

Cross-section studies are valuable for survey purposes. Problems of child development require a longitudinal view from the earliest possible age to the completion of maturity. It seems to me that provisions should be made in some institution to study normal children from birth to maturity in all of their developmental aspects. This program would mean

an extension of the usual school facilities in both directions. Much has happened to the child before he enters the first grade; some few changes, at least, will take place in the individual after he leaves high school.

Unified rather than segmental data.—Children are to some extent the type of individuals that our educational system makes them. It is imperative therefore that we view each child as a unified personality. Biologists see children as animals, physiologists see them as complex organisms, psychologists see them as reacting mechanisms, psychiatrists see them as the bundle of complexes, while no one seems to see them as all of these and more. Records systems and research workers are inclined to break the child into so many segments that he is never put together again. There has been some attempt in the last few years to piece together our children who have been dissected so minutely in the past decade or two. A view of the child *in toto* means that a complete set of records must be available for each individual. Some of us have studied intellectual growth, some have analyzed skeletal changes, some have counted teeth, while others have placed all of the sins of childhood at the door of nutrition. Any one of these aspects of development is significant but the complete picture of the child and the group to which he belongs helps to give a more adequate interpretation of his development in any one segment. It may be simpler at the moment to collect a single type of data but analysis and interpretation of results are likely to be more valid if a unified picture of each subject is available in the records.

DESIRABLE TYPES OF DATA FOR RESEARCH PURPOSES

A records system which aims to be reasonably suitable for research purposes must contain means for collecting and classifying certain types of data. These data may be divided into two major types: histories and developmental records.

There are three aspects of the child's life concerning which histories are needed, namely: his hereditary background—the family history; his social environment—social history; and his health and bodily characteristics—physical history. Family histories should include information concerning ancestors, racial stock, vocation of parents and grandparents, religion, and the like. These data are relatively constant for a given child and may therefore be collected once during the pupil's stay in school. Deaths, changes in vocation, or other significant facts about the parents should be noted if they occur during the school life of the child.

Social histories should include a fairly complete account of the child's environment. Such items as size of residence, library facilities, magazines in the home, associates, siblings, servants, chums, interests, and the like should be carefully noted in the social history. Social or environmental factors are so important in the life of the child and change so frequently during the course of a school career that there is need for a social history which is continuously revised as data are available. Pertinent facts should be checked at least annually. The University of Chicago Laboratory Schools have been constantly confronted with the weakness of a social history obtained once during the life of the pupil. An only child who enters kindergarten at five years of age may have siblings who affect his life significantly before he reaches high school. This situation is only one illustration of the necessity for a constantly revised social history for each pupil.

Physical illness, birth conditions, physical defects, and physical characteristics should be recorded in the physical history. Physical histories like social histories need to be revised at least annually. There are some physical items which do not change during a school career, while other items occurring from time to time color the entire developmental program of the child.

Histories may be obtained as a matter of routine once the desired items are agreed upon and the records taking program has been established. Developmental characteristics of the child are more difficult to obtain but may be more significant than histories if the information is adequately recorded. At least four types of developmental records are required to construct a complete picture of the child: physical, mental, personal, and scholastic.

Physical development can be considered under a number of separate headings. It seems that the following categories include most of the items of interest to research workers: measurements of gross size, skeletal evaluations, muscular changes, organic development, and glandular functioning. Such an item as walking is only one aspect of muscular coordination and should be classified under that heading. Carpal development or teething records are a part of the skeletal changes which take place in the child and should be classified accordingly. Gross measurements give some indication of the general body type as well as the developmental progress of an individual as he moves toward maturity. Developmental results of the annual physical examination find their place under appropriate headings, while an accident or illness becomes a part of the physical history.

Mental test scores along with observable changes in mental characteristics constitute a basic part of the records of mental development. Any neurotic symptoms which may later affect the efficiency of the child serve as a clue for psychiatric workers. Mental problems, their development, diagnosis, and cure become a part of the intellectual developmental record of the child. Recurring symptoms can be interpreted and dealt with in the light of previous experiences only when the previous experiences have been properly recorded.

Those personal qualities which so-called personality tests attempt to evaluate should be described fully in the personal record of the child. Behavior which deviates either positively or negatively from the usual conduct of children needs to be noted carefully and filed in personal folders. Parents, teachers, principals, and special workers—physicians, psychologists, and others—know a lot about children which never finds its way into the records in the usual school system. Why did Oswald exhibit a peculiar brand of disreputable behavior on January 9, 1934? It is quite probable that such a question could have been answered if the facts known about Oswald had been recorded. Research workers must constantly fight against the odds of thin ice as long as school officials carry valuable information around in their heads when it should be in the personal folder of the children. One constantly encounters—"Oh, I could have told you that," after many valuable weeks of work have been spent piecing together fragmentary evidence from miscellaneous sources. The value of information of an intimate type must be sold to those persons who come into close contact with pupils before significant progress can be made in evaluating or developing personality of school children.

Scholastic records should contain everything known about the child's achievement and school progress. Achievement test scores certainly but more than that, the results of conferences, reteaching efforts, after school classes, tutoring, symptomatic behavior, and the like must be found in a complete scholastic record. Provisions need to be made to obtain qualitative information for the records if relationships between scholastic progress and physical development are to be determined. Scholastic growth and personality changes can be compared only when detailed accounts of each type of development has been properly recorded. A boy whose spelling scores shifted from the top to the bottom of his class from grade four to the second year in high school would likely have a scholastic record showing a gradual decline in the relative efficiency in spelling

the words attempted. There were without doubt several incidents in the child's life during this period of schooling which would give clues for a proper diagnosis of the spelling disorder. It is difficult, nearly impossible, to reconstruct the exact path of a given pupil in his development when only the beginning and the end points of his journey are known. Once he was very good, now he is very bad; means little to the investigator who knows the child, only by a code number. Developmental records must utilize every quantitative measure available but there must also be a more liberal use of those qualitative types of information which are forever lost unless teacher, principal, and advisor take the trouble to make a record of their knowledge about pupils.

COLLECTING INFORMATION FOR CUMULATIVE RECORDS

Methods of collection.—When the machinery has been established for obtaining data some policy has to be pursued in collecting the desired information. A records office staffed by competent, alert individuals can assemble much valuable data from incidental records of the school. Incidental information, however, provides insufficient evidence to construct the total developmental history of a child.

Periodically a testing program, a physical inspection, or a survey of scholastic status may find its way into the school routine. Data assembled from such periodical tests or examinations should become a part of the cumulative records. Periodical records like incidental facts are only a part of the needed information for research activities.

Systematic records taking for scientific purposes is required to build an adequate body of data concerning each child. A testing program demands that the element of time or age be controlled rigorously. The Laboratory Schools of the University of Chicago have found it quite convenient to make all systematic tests on or very near the child's birthday. A complete physical examination including anthropometric measurements, one or more mental tests, and an X-ray of the hand have been a part of the testing program over a period of years. These tests and examinations have been scheduled during the week in which the child's birthday occurred. There are two major advantages in using birthday examinations. First, all of the data cumulated by this method are strictly comparable as far as age is concerned. A sample of eight-year-old children would be eight years plus and minus ten or fifteen days rather than eight years plus and minus six months as is frequently the procedure in an investigation. A second major advantage is that the

measurement program is staggered throughout the year so that there is no piling up of testing at the opening or closing of the school year. Birthday examinations make it impossible to study seasonal variations in pupils since the examinations are scattered over the year. This disadvantage becomes an advantage in that seasonal changes are smoothed out by spreading the sample at any one age over the entire school year. Children whose birthdays fall in the summer months may have to be omitted from the regular testing program unless examinations are made semi-annually. Semi-annual examinations would mean that about half of the school population would have one examination per year, since one group of children would have their birthdays in the summer and another group would have the half year examinations falling in the summer. The Chicago Laboratory Schools have followed the practice of making physical examinations of all pupils whose birthdays came in the vacation months at the half year points. Such pupils have been omitted from the regular testing program used to study the various aspects of growth.

Birthday examinations are especially advantageous in a study of individual growth. The intervals between examinations are always constant, twelve months. Many of the functions of the child grow so slowly that measurements become meaningless if they are made with less than a twelve months interval. In fact, head size of school children is so close to mature size that annual increments are frequently as small as the error of measurement.

Some types of data, such as attendance, should be collected by continuous records. Reading lists, special merit in some activity, or special disability in a given task should be recorded whenever they are available. The developmental history of the child can be shown only by a careful notation of all pertinent developmental factors. A wider use of the continuous type of record would provide a valuable body of data for the research worker.

An adequate records system will not rely upon any one method for collecting the necessary data. Appropriate means must be set up for assembling all types of information concerning the child whether collected incidentally, periodically, annually, or continuously. Methods of collection should be suited to the type of information desired rather than to the convenience of a particular school officer or a particular research worker.

Collecting agents.—Opinion differs sharply as to the personnel needed in a school established to do research work. Must all data be collected by specialists? Perhaps more pertinently, is it possible for specialists

to collect all data needed? What part does the regular teacher have to play in the assembling of information other than scholastic marks? It is apparent that physicians must be used for physical examinations if accurate, detailed information is obtained. It is also necessary that these physicians have more than a passing interest in anatomy, pathology, pediatries or growth. If research is the end desired from physical records, something more than degree 1, 2, or 3 will have to find its way into the notations of the medical examiner. A change of physicians usually means a change in the value of the notations. A short hand system of recording is desirable for summary cards but a complete description of any deviation from normal is the least that should be expected from the physician's report.

Psychologists will be needed to give or supervise the giving of certain tests. They will also be called upon to conduct or direct certain types of research. Impressions, diagnoses, and evaluations of the psychologist must become a part of the record as well as the mere listing of IQ's or raw scores. A record may be perfectly adequate if all the persons who helped collect information are available to interpret their systems of shorthand. Sketchy notations and individual shorthand symbols become meaningless when they are ten or a dozen years removed from the event observed.

Most schools have found that a general coördinator is required if the records system is to be kept in a usable condition. The various individuals who are responsible for collecting special types of data sometimes neglect their duties unless there is someone to check the completeness of the information. Clerical workers who assemble, classify, and record the information collected may be placed under the supervision of the person in charge of the records office. This individual represents the school on the one hand and the research workers who use the data assembeld on the other. It is his duty to assist and supervise students who may be sent to inspect or work with the various types of information assembled in the records office.

Specialists are needed to keep a cumulative records system in progress. Parents, teachers, principals, and directors of special activities must coöperate fully by furnishing information concerning the child if individual growth is to be a part of the research program. Mass data and statistical techniques may give a fair picture of the group as a whole but a detailed account—including tests, measurements, and observa-

tions under many conditions—is necessary to interpret the changes in the life of a given child.

ARRANGING INFORMATION FOR USE

Filing the data.—How shall the data be kept once they have been collected? Some institutions have followed the policy of complete departmentalization. Principals have scholastic information, psychologists have mental test records, physicians have the results of physical examinations, psychiatrists have the personal data, teachers have attendance records, and so on through the entire range of information collected. The University of Chicago Laboratory Schools brings all types of information together in a central office. A centralized records system appears to be most desirable for research purposes, if the whole child is the interest of the investigator. Segmental research may be done efficiently by decentralization, but a study of individual growth is practically impossible without a centralized system of records. Persons who have collected data and arranged it in their personal files become quite jealous of their possessions. One who attempts to borrow from departmentalized records is looked upon with great suspicion. Centralization removes all of these suspicions since all records are a part of the system rather than the property of individual staff members.

Cumulative cards and individual folders.—Cumulative summary cards have proved to be very valuable aids to research workers. The card is a starting point for the selection of subjects who fall into certain predetermined categories. Subjective impressions and lengthy comments must be filed in personal folders. Samples of school work, good and bad, are conveniently preserved in the individual folders. Everything known about the child as an individual pupil should be found in the personal folder in its original form. Raw test scores, behavior deviations, remedial procedures, prolonged absences, and the like are types of information which belong in the folder, whereas the cumulative card merely summarizes various types of data with the keys and codes to detailed reports and comments.

TRAINING PROSPECTIVE RESEARCH WORKERS

One of two points of view may be taken toward a records system for research purposes. All data may be considered as confidential materials for the research projects of staff members, or the information assembled may be used to train future research workers as well as to supply facts for the present staff. Too much money and effort have been expended

in collecting data to keep all of these valuable facts under lock and key for the exclusive use of staff members. No one man or group of men can explore all of the possibilities of an adequate records system. Some types of data may have to be kept from the novice until he proves his qualities. It is difficult to see how a potential research worker who betrays the confidence of his superiors can ever hope to succeed as a professional person. Students who are permitted to deal first hand with the accumulated records under the direction of professors and research workers get a freshness of contact with genuine problems in a real situation. These potential values of the records should be utilized to train prospective investigators. A training program may be a slight inconvenience to the regular staff but the ideas and criticisms of competent students will more than offset the troubles encountered.

SOME PROBLEMS FOR FUTURE CONSIDERATION

A number of child development centers have been assembling data for many years. Various segments and periods of growth have been studied. It may be possible to make some exchange of data from center to center in order to increase the size of the sample in certain types of studies. For example, Iowa, Harvard, Chicago, and other institutions have been studying ossification. The samples of data at certain ages are relatively small in some of these studies. A system might have been devised whereby two or more schools could have studied this problem coöperatively.

An exchange of materials or even a comparison of results demands more uniformity in procedures, in units of measure, in records used, and perhaps in the coding of items. Problems on which we are agreed could be pursued coöperatively, while new problems, advanced techniques, and further applications would be the field for differentiation in the various child development centers. Too much time is being lost in doing over problems which were of no value from the start. Some problems should be allowed to rest or be discarded entirely until new techniques have been developed to deal with them. Records systems must constantly be revised in the light of present knowledge so that every phase of the child's life is adequately evaluated by the best known techniques. Practice in some of the better experimental centers is far behind the results of research. There is no system whereby administrators are able to keep their machinery perfectly balanced in the light of discovered facts. Profitable research from records systems can be produced only when reliable, complete, and adequate information has been assembled in a usable form.

THE RELATION OF PARENTAL OVER-ATTENTIVENESS TO CHILDREN'S WORK HABITS AND SOCIAL ADJUSTMENTS IN KINDERGARTEN AND THE FIRST SIX GRADES OF SCHOOL[1]

BERTA WEISS HATTWICK AND MARGARET STOWELL
Winnetka Public Schools

DOES over-attentiveness—either in the form of "babying" the child, or in the form of exerting too much pressure upon him—influence that child's performance and social adjustments during the kindergarten period and the first six grades of school? It was in an attempt to secure an answer to this question that the following investigation was undertaken.

SOURCE OF MATERIAL

The source of the material was the file of cumulative records of children in the Winnetka Public Schools. These cumulative records (a separate one for each child) are prepared by each successive classroom teacher at the end of a year's experience with the child. They are frank, confidential reports for the benefit of the succeeding teachers who will deal with the child, his interests, activities, problems and home. Winnetka teachers are in unusually close contact with the homes. They have all had considerable mental hygiene training. These records, therefore, are usually reasonably accurate and reliable, especially when one has a series of them by different teachers dealing with the same child.

For the present study, the alphabetical file of cumulative records was used, approximately the first 500 records (alphabetically speaking) being taken for analysis. These were examined for evidence which would indicate that the child under consideration was (a) babied at home (b) unduly pushed by his parents or (c) that he came from a well adjusted home situation.

The following examples, taken verbatim from the records, will indicate the type of information on which these judgments were based:

Child Babied by Parents

"An only child whom mother admits has been spoiled"
"Child is indulged and pampered"
"Youngest child of family and is spoiled"

[1] This study was suggested by Carleton Washburne, Superintendent of the Winnetka Public Schools.

"Has had governesses and nurses who did too many things for him. Younger of two children, the other being grown up."

"Mother tries to shield him from life too much"

Child Pushed by Parents

"Parents have high standards of scholarship. Expect him to grow up overnight and to show scholastic abilities which some relative did."

"Mother inclined to push child"

"Mother anxious for child to make greater progress"

Home Well-Adjusted

"Ideal home with interested and understanding parents"

"Serene home life"

"Home situation quite ideal—harmonious and coöperative"

"Every opportunity for children. Finest relationship between parents and children"

"Home normal and coöperative"

"Congenial family; children understood; atmosphere of calmness"

A total of 200 records were secured in this first analysis. These 200 records were then sorted to eliminate all cases in which only one report was given and all cases having sketchy or incomplete data. A total of 146 records were left after this analysis: 51 in which the parents babied the child, 22 in which the parents exerted too much pressure upon the child, and 73 in which the home life seemed well-adjusted.

These 146 records covered a range extending from Kindergarten through the sixth grade of school. Since, in the statistical analysis, only the first and last records for a given child have been considered, the distribution of records according to school grade have been made below in terms of that division:

DISTRIBUTION OF RECORDS ACCORDING TO GRADES

Records Analyzed	Number of Records per Grade							
	K	1	2	3	4	5	6	Totals
	Child Babied at Home							
First	13	12	8	4	13	1		51
Last				9	9	16	17	51
	Child Pushed by Parents							
First	3	8	2	2	7			22
Last					3	12	7	22
	Home Well Adjusted							
First	13	15	14	16	14	1		73
Last			3	1	25	24	20	73

After these records had been secured each was carefully read and every statement pertaining to the child's work or social habits was recorded. While all the records were in diary form, they were sufficiently complete to afford two types of data: (1) information as to whether the given child's work habits and his social habits were adequate or whether they were creating problems; (2) information as to the types of behavior which the teacher used as examples of poor work or social adjustments and the relative frequency of each of these.

As a check on the reliability of the above material, approximately the first half of the records secured (30 records on children babied, 12 on children pushed, and 35 on children from well-adjusted homes) were analyzed separately and compared with the results for the remaining cases (21 records on children babied, 10 on children pushed, and 38 on children from well-adjusted homes.) The trends represented by these two sets of data were in complete agreement with one another and consequently with the results for the total group.

No check on the validity of the material was possible. Since each teacher's report was a voluntary description of the child after a year of close contact with him, since the report was in no wise colored by a preconceived classification or terminology to which the teacher had to adhere (and since, consequently, all of the records represent cases where the given home factor or school behavior was a rather obvious fact) it seems probable that the validity of the material is high.

THE FINDINGS

Traits Descriptive of Poor Work Habits.—In their yearly reports on children, it is customary for the teachers to dismiss satisfactory or good performance and adjustment with a few words and to concentrate more on their description of the less satisfactory cases. For this reason the following list of behavior traits characterizing poor work habits is not paralleled by a similar list for satisfactory performance.

The frequencies indicated in the following tabulation represent the number of children (from the total group of 146) in whom the given behavior was reported as occurring. A child is included under a given category if he was described as falling under that category in any one of the available reports on him. No child is included under a given category more than once.

Interestingly enough, behavior which necessitates the time and attention of the teacher heads the list. Failure to meet the proper work stand-

TEACHER DESCRIPTIONS USED AS INDICATIONS OF POOR WORK HABITS

Behavior Occurring	*Occurrence Homes where Child is Pushed or Babied* No. of Cases	Percentage of Total[1]	*Occurrence Well-Adjusted Homes* No. of Cases	Percentage of Total[2]
Needs pressure, encouragement, supervision or individual attention from teacher	70	96	12	16
Doesn't work to capacity; meagre accomplishment; slow, inferior progress	65	89	17	23
Careless in work; poor irregular work habits	44	60	11	15
Lazy mentally; loafs and wastes time; dawdles	21	29	5	7
Easily discouraged; good at first but doesn't like to see work through	20	27	2	3
Distractible; no concentration	19	26	2	3
Indifferent; no interest	13	18	0	0
No perspective or philosophy toward work; poor organization of work	12	16	2	3
Works fitfully; spasmodically	10	14	1	1
Needs self-confidence	8	11	1	1
Slow at starting work	5	7	4	5½
Avoids disliked work	5	7	3	4
Persistent and concentrates only when likes what he is doing	5	7	1	1
Apt to be resentful; sullen	5	7	2	3

[1]Percentage of 73 cases babied or pushed in home.
[2]Percentage of 73 cases from well-adjusted homes.

ards—a second rather objective criterion—stands second. The remaining types of behavior in this tabulation deal largely with the child's approach to his work. Carelessness, dawdling, lack of system, lack of interest and distractibility are the more outstanding of these traits. For every descriptive category included in the classification of poor work habits, examples are far more numerous for children from over-attentive than for children from well-adjusted homes. This leads to the second phase of the analysis.

Relation of Over-Attentiveness to the Child's Work Habits.—Table I indicates the proportion of the children in each of the three groupings (children babied, children pushed, and children from well-adjusted homes) who had good or poor work habits (a) on their first and (b) on their last available records. It will be seen, on the basis of first records, that the work habits of children pushed and children babied were predominately poor. On the other hand, the work habits of children from

TABLE I

RELATION OF WORK HABITS TO THE THREE HOME FACTORS

Group	N	Work Habits (Percentages) On Basis of First Records Good	Poor	On Basis of Last Records Good	Poor	Significance of Differences D	D.P.E. Diff.	Chances in 100
Children Babied	51	27%	73%	20%	80%	−7%	1.23	80
Children Pushed	22	18%	82%	18%	82%	0	....	....
Children from well-adjusted homes	73	75%	25%	77%	23%	−2%	0.43	62

well-adjusted homes were predominately good. These same relationships are apparent also on the basis of last available records. There is, however, a tendency for poor work habits to increase in the case of children babied and to decrease in the case of children from well-adjusted homes.

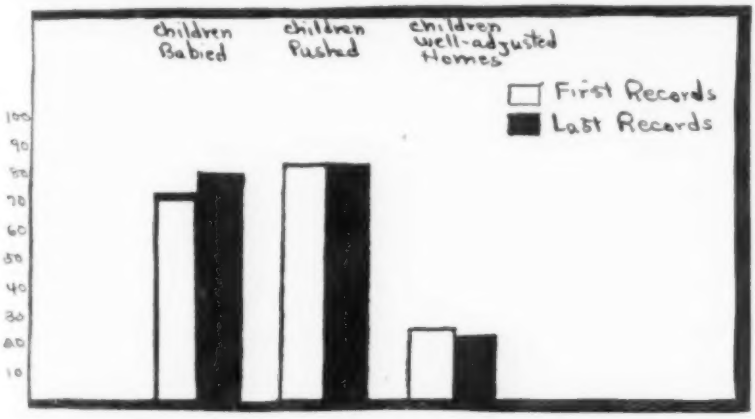

FIGURE I: RELATION OF WORK HABITS TO THE THREE HOME FACTORS

While there are, statistically speaking, only 80 chances in 100 that the same trend would be found in another group of babied children selected from the same population, and there are only 62 chances in 100 that the same trend would be found for another group of children selected from well-adjusted homes in the same general population (Table I,) the fact that the trends were consistently found in both of the partial analyses as well as on the analysis of total data, makes them particularly worthy of note in the present set of data.

Another point of interest in the data of Table I is the similarity in the work habits of children babied and children pushed. Apparently over-attentiveness makes for poor work habits, regardless of the manner in which it is expressed.

Traits Descriptive of Poor Social Adjustment.—The following tabulation indicates the types of behavior mentioned by teachers in describing poor social adjustments, and the frequency with which each was mentioned in the group of 146 cases.

A particularly interesting feature of this tabulation is the frequency of withdrawing, dependent behavior as contrasted with aggressive reactions. A recently completed study on nursery school children has substantiated this finding. In that particular study children from over-

TEACHER DESCRIPTION USED AS INDICATIONS OF POOR SOCIAL ADJUSTMENT

Behavior Occurring	*Occurrence Homes where Child is Pushed or Babied* No. of Cases	Percentage of Total[1]	*Occurrence Well-Adjusted Homes* No. of Cases	Percentage of Total[2]
Socially immature	38	52	5	7
No sense of responsibility; not dependable	29	40	5	7
Nervous, high strung	26	36	10	14
Agrees too readily; a follower	19	26	8	11
Dependent on adults; a baby	19	26	5	7
Not well liked by others	19	26	2	3
Shy, self-conscious	17	23	11	15
Plays for attention	15	21	0	0
No initiative	14	19	2	3
Day dreams	11	15	5	7
Teases, annoys others	11	15	1	1
Withdraws from group	10	14	4	5½
Can't meet new situations well	10	14	1	1
Contrary, quarrelsome; a trouble-maker	10	14	1	1
Insists on own way; selfish; spoiled	10	14	1	1
Lacks self reliance	9	12	2	3
Timid, fearful; a coward	8	11	5	7
Insecure	8	11	2	3
Negativistic; not cooperative	7	10	1	1
Loses temper	7	10	0	0
Sensitive	6	8	6	8
Too aggressive	6	8	2	3
Deceitful	6	8	0	0
Much too serious	5	7	5	7
Self-centered	5	7	2	3
Unhappy	5	7	0	0
Doesn't know how to play with others	4	5½	1	1
Has inferiority feeling	3	4	3	4
Inconsiderate of others	3	4	2	3
Criticizes others unfairly	3	4	1	1
Moody	3	4	0	0
Repressed	3	4	0	0
Has difficulty making decisions	2	3	1	1
Complains	2	3	0	0
Rationalizes	1	1	0	0

[1]Percentage of 73 children babied or pushed at home.
[2]Percentage of 73 children from well-adjusted homes.

attentive homes showed definite tendencies toward submissive behavior while children from negligent homes showed equally definite tendencies toward aggressive behavior.

The tabulation also reveals a much higher frequency of poor social adjustments in the case of children from over-attentive homes than in the case of children from well-adjusted homes. This point is discussed further in the following section.

Relation of Over-Attentiveness to Social Adjustment.—Table II indicates the proportion of the children in each of the three groupings (children babied, children pushed, children from well-adjusted homes) who were adequately or inadequately adjusted in social relationships, as indicated by their first and last available records. The differences are marked. Children from well-adjusted homes are clearly better adjusted socially than children from over-attentive homes. This is true on the basis of last as well as on the basis of first available records. In fact,

there is a tendency for the difference to become more marked with the years. This last tendency is not statistically significant, though it is sufficiently large to deserve attention. In the case of children babied there are 84 chances that a similar group of records would also reveal more cases of poor social adjustment on the last than on the first analysis.

TABLE II

RELATION OF SOCIAL ADJUSTMENT TO THE THREE HOME FACTORS

Group	N	Social Adjustment (Percentages)				Significance of Differences		
		On Basis of First Records		On Basis of Last Records		D	$\frac{D}{PED}$	Chances in 100
		Good	Poor	Good	Poor			
Children Babied..	51	24%	76%	16%	84%	+8%	1.51	84
Children Pushed..	22	18%	82%	23%	77%	−5%	0.62	66
Children from well-adjusted homes.	73	70%	30%	73%	27%	−3%	0.47	63

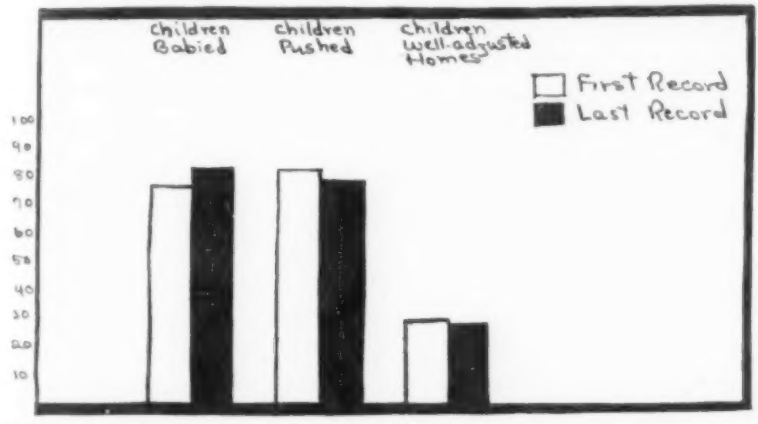

FIGURE II: RELATION OF SOCIAL ADJUSTMENT TO THE THREE HOME FACTORS

SUMMARY AND INTERPRETATIONS

The study has indicated that children who are babied or pushed by their parents have many more social difficulties than children from well-adjusted homes. Such children also have greater difficulty in work habits—and consequently in matters of purely academic progress.

These findings held throughout the grades investigated. In fact, there was a slight tendency for children who were babied to develop more social difficulties and poorer work habits through the years. The tendency for children from well-adjusted homes was in the opposite direction.

The tendency for "babied" children to develop poorer work habits through the years seems to be part of a vicious circle; the parents are over-attentive—the child gets along poorly at school—the parent, conscious of this poor school achievement, becomes ever more attentive—and so on and on. It is difficult in this particular case to know whether over-attentiveness on the part of the parent or inadequate performance on the part of the child was the initial factor.

In general, the study has shown that the work of the school depends to a marked extent on parental attitudes. When the parents are over-attentive the school is waging an up-hill battle in its attempt to improve the child. Only when the home is well-adjusted can we have any assurance that the work of the school will be successful.

THE CAMPUS AND SOCIAL IDEALS

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THE purpose of this report, as also of a study previously reported,[1] is not so much to emphasize the findings as to call attention to the need of extended investigation of the problem.

The avowed aims of some thousand liberal colleges include social goodwill, under one name or another. At few points do these colleges more closely agree. Hundreds of books and thousands of periodical articles supplement the publicity materials in support of such claims for the cultural college.

One amazing aspect of the whole picture is the credulity with which wishes are accepted as accomplishments. Patrons and presidents alike appear to assume that, with a social purpose, social products are inevitable.

A question of paramount importance to parents and to patrons of higher education is whether the college with social ideals increases the social ideals and motives of its students. This question is raised with no thought of implying a negative answer. It is merely the assertion that those concerned should know the facts. Bleeding of patients was a common medical practice for years—until the scientific spirit led to the investigation of actual results. There is need, then, to know whether the typical liberal arts college actually improves the character and citizenship of its students.

If an affirmative answer is established then the colleges face a second challenge: Can the various agencies which contribute to the social idealism of students be studied under controlled conditions, and their relative effectiveness be discovered? Leaving academic goals out of account—or assuming that outcomes in terms of knowledge and skill are satisfactory, and that present curricula and methods are well adapted to the desired products in this field—this question remains: What procedures or agencies contribute most to the cultivation of wholesome social motives? If social control is to be exercised by society through the college, it is as necessary to isolate the agencies that cultivate social motives as for the research scholar in medicine to isolate a disease germ in the interests of disease control.

[1] Tuttle, Harold Saxe. *The Campus and Social Ideals: A Study of the Influence of Campus Agencies on the Increase in Socialmindedness of College Freshmen.* Published by the author, College of the City of New York, 1936. Pp. vi + 88.

The author made two preliminary studies in the hope that the socializing program of the college might prove to be based on tradition and wishful thinking less than appeared. The first was a survey of the literature to discover whether controlled experiments had been conducted to determine the relative effectiveness of various materials and procedures. The controlled experiments reported were too few and inconclusive to justify the publication of the report.[2]

The second inquiry was addressed to college administrators. It is quite possible that practical experience might develop in those responsible for campus procedures a degree of insight approximating the reliability of objective measurement. Assuming that any considerable agreement of independent judgments would afford presumptive evidence in this direction, replies from three hundred executives or their delegated representatives were tabulated and analyzed. The results are disappointing to all who hoped that uniformity of independent judgments might furnish evidence of sound methods.

It should be pointed out that the replies were *not limited* to the one agency which contributes most to socialmindedness, but rather "to *those agencies on which chief* reliance is placed." On the average, approximately four agencies were named in each report. If, by chance, first choices reflected prejudices, second choices, at least should reveal common insight.

Almost every conceivable campus agency found a place in some list. Yet, only by the broadest classification of agencies could identity be found in as many as 20 percent of the reports.

TABLE I

MEANS OF TRAINING IN SOCIALMINDEDNESS AS REPORTED BY 275 COLLEGES

Total Situation—170		Specific Procedures—117			
Aspects Emphasized		Courses		Activities	
Faculty influence	10	Survey, social field	60	Guidance, counselling	33
Small enrollment	4	Bible and religion	45	Assembly or chapel	46
Traditions, atmosphere	2	Sociology, ethics	45	Extra curricular act.	41
Democratic spirit	2	Psychology	20	Field service projects	29
Self support	2	Literature	20	Dormitory life	4
Integrated curriculum	1	Science	7		

The accompanying table tells its own story. If there are agencies which distinctively contribute to social ideals of students, those who control educational policies have not generally discovered them. This their own

[2] The unpublished manuscript is on file in the office of Higher Education, Teachers College, Columbia University, New York.

statements attest. Indeed, many of the letters supplementing the data on the report sheets expressed genuine concern over the baffling nature of the problem.

College officials who are perplexed over the problem of cultivating social motives may be expected to feel chief interest in any new pertinent evidence.

The final study has significance chiefly along two lines: it indicates that the technique employed is practicable, and available for extended use in parallel and expanded studies; it identifies four specific agencies whose further study would appear to be especially profitable. It may be suicidal to its extension to report,—but it would be difficult to refute—that substantial corroboration of the tentative findings of this study would indicate the need for fundamental changes in method and in curriculum in the liberal arts college.

TECHNIQUE

A paper-pencil test of socialmindedness (as contrasted with individualism) was carefully standardized.[3] A detailed account of the process of validation is given in the report cited.[4]

Under arrangement with their executives, four colleges were selected for study. Social attitude tests were given to all freshmen in September and May. *Gains,* rather than final scores, were taken as the basis of all studies. The tests were also given to the staff members in whose classes 15 or more freshmen were enrolled.

The test is so constructed as to indicate two types of reactions—one is consistency in the application of civic knowledge, the other, the degree of social mindedness as contrasted with individualism. The latter function is the one which provides the needed data in the present study. In order that the test might function ideally in this area, this function was concealed as completely as possible, emphasis being given to the other, the intellectual aspect.

After the second test had been given, a data blank was distributed under independent auspices, without hint of relation to the attitude test. On this blank the students reported such items as the following: (a) participation in extra-curricular activities, together with statements

[3] Maller, J. B. and Tuttle, H. S. *Social Orientation.* New York: Institute of School Experimentation, Teachers College, Columbia University, 1935.

[4] Tuttle, H. S. *The Campus and Social Ideals.* See also *Bulletin of the Association of American Colleges,* XXI, 552-54.

of official responsibility and degree of enthusiasm, (b) economic status and any changes in that status during the year, (c) participation in athletics, (d) the spontaneous reading of periodicals, (e) vocational aims, and the vocation of parents, (f) their own judgment of the effect of college training on their own social attitudes, together with a list of the chief influences which produced that change.

From the registrar's office the following facts were secured for each student: courses, grades, instructors, living conditions, score on admission psychological test and educational test, and religious affiliations.

Basing all comparisons on the gain in social attitudes (indicated by the difference between September and May scores), correlations were computed with each type of data secured from the registrar's office and provided on students' own data sheets. Wherever data were of such a nature as to provide a continuous distribution of all students, the product-moment correlation coefficient was computed. This was found possible with reference to intelligence quotient, college grades, and initial attitude score, as also between initial score and intelligence quotient.

All other data were of such a nature as to group students into one of two categories—either fulfilling the criterion or not doing so. This limitation is obvious, as for example, a student either did read progressive magazines or he did not; he was in the class of professor "A" or he was not; he worked to help pay his way or he did not. Thus the great majority of correlations were limited to the biserial type. After computing all direct correlations an extended process of partialling out other factors was carried on.

Thus the freshman group in each college was measured for gains in socialmindedness, and these gains compared with each campus influence for which data could be secured. Table II contains all the data and computations which appeared to have any significance in the study.

FINDINGS

The findings of the study are reported very frankly as tentative. The number of colleges which it was possible for an individual to study within a limited time-period was insufficient to serve as a basis for assured conclusions. The indications from the four colleges studied, however, are at many points so strikingly alike and so challenging to traditional methods as to deserve attention from those interested in liberal education.

TABLE II

Changes in Scores on Social Attitude Test among Freshmen in Four Colleges

Correlated with Various Factors

	College A		College B		College C		College D	
Mean gain	40.33		44.73		23.70		29.56	
S. D. of gain	25.4		30.6		29.0		26.4	
Number of cases	40		77		165		34	
	r[1]	%[2]	r[1]	%[2]	r[1]	%[2]	r[1]	%[2]
I. Campus influences:								
1. Progressive reading	.74	45	.21	38	−.03	09	.46	35
2. Extra-curricular: traditional:								
a. Participation[6]	.24	09	(*)[3]	05	−.02	14	.06	17
b. Enthusiastic participation	(*)[3]	05	(*)[3]	03	.19	18	(*)[3]	06
c. Official responsibility[6]	.24	09	−.09	40	(*)[3]	04	...	..
Extra-curricular: service projects:								
a. Participation[6]	(*)[3]	05	−.35	09	.13	11	.65	09
b. Enthusiastic participation	.74	07	(*)[3]	08	.27	18	.40	15
c. Official responsibility[6]	.17	13	−.04	55	.05	09	(*)[3]	03
3. Participation in athletics	−.17	28	.10	70	.07	81	.20	53
4. Finances: work necessary	.16	35	.18	17	.08	23	.31	53
Finances: decreased security	.40	09	(*)[3]	03	...	..	...	..
5. Courses:								
a. Social studies[6]	...	..	−.05	86	−.09	58	...	..
b. Literature[6]	...	..	−.01	87	(*)[3]	99	...	..
c. Science	...	..	.09	36	(*)[3]	99	...	..
d. Fine arts[6]	...	..	−.53	90	.29	45	...	..
e. Foreign languages	...	..	...	..	(*)[4]	96	...	..
6. Living quarters: dormitory	.05	57	...	..	.25	31	...	..
7. Faculty members[6]: (These letters refer to different individuals in the two colleges.)								
A	...	..	.41	36	.45	13	...	..
B	...	..	.34	19	.30	16	...	..
C	...	..	.15	29	.23	21	...	..
D	...	..	.13	34	.16	16	...	..
E	...	..	.13	22	.16	16	...	..
F	...	..	.10	16	.12	19	...	..
G	...	..	.08	25	.02	22	...	..
H	...	..	.08	39	.01	08	...	..
I	...	..	−.08	34	.01	09	...	..
J	...	..	−.20	19	−.03	42	...	..
K	...	..	−.23	16	−.05	34	...	..
L	...	..	−.25	22	−.07	21	...	..
M	...	..	−.26	18	−.07	40	...	..
N	...	..	...	..	−.09	12	...	..
O	...	..	...	..	−.14	13	...	..
P	...	..	...	..	−.16	20	...	..
Q	...	..	...	..	−.18	14	...	..
R	...	..	...	..	−.21	21	...	..
S	...	..	...	..	−.22	16	...	..
T	...	..	...	..	−.26	19	...	..
II. Factors other than campus agencies:								
1. Men compared with women[6]	−.05	14	...	..	−.22	47	...	..
2. Religious affiliations[6]:								
a. Protestants	−.68	25	.21	75	.11	44	...	..
b. Catholics	−.02	15	(*)[3]	05	...	..	...	..
c. Jews	.42	48	(*)[3]	05	...	..	...	..
3. Vocation: business, not professional[6]:								
a. Parent	−.13	48	.00	43	...	..	−.04	37
b. Student's choice	...	..	−.03	60	.09	50	...	..
4. Estimate of college influence:								
a. Favors social motives	.47	93	.04	88	.04	82	.50	77
b. Credits leadership	−.29	35	(*)[3]	04	...	..	(*)[3]	03
c. Credits courses	.13	15	...	..	...	..	.06	38
5. First score attitudes :: gain[5]	.12	(@)[4]	−.34	(@)[4]	−.11	(@)[4]	.02	(@)[4]
6. Psychological score (IQ) :: gain[5]	.38	(@)[4]	−.36	(@)[4]	.12	(@)[4]	...	..
7. First score attitudes :: IQ[5]	...	..	.31	(@)[4]	.25	(@)[4]	...	..
8. College grades :: gain[5]	...	..	.00	..	−.04	(@)[4]	...	..

[1] r is correlation between score gain on social attitude test and factor indicated.
[2] % is percent of cases in given college falling in the category indicated. (Bi-serial correlations are used in above table.)
[3] * indicates percentage too small to yield reliable co-efficient.
[4] @ indicates product-moment correlation.
[5] :: separates the distributions correlated.
[6] Negative correlations do not signify unfavorable influence of factor involved. See page 37 and f.n. in published report.

Reading progressive magazines appears to influence social attitudes more than any other single agency. The library may justify far more attention than has yet been given it, and a radical modification of methods for stimulating reading on current problems. Financial insecurity and the necessity of working during the college year shows marked evidence of favorable influence on social attitudes. Student self-help programs may prove to be more than mere uncomfortable necessities for those who are ambitious for a college education. Coöperative service projects, although few in number, appear to be highly significant. Those who participated in such activities were disproportionately near the top of the list with reference to attitude improvement. Activities of this sort deserve much more study than has been given them. They justify extended experiments as unhandicapped elements of the college curriculum. During the experimental stage, at least, they should be given college credit to prevent the undue competition of activities which carry credit.

Faculty members appear to have widely varied influence on the students within their classes. The selection of staff members with references to their influence on student ideals may be a much more crucial problem than has been assumed.

If this study is to have permanent and extended value, it must be followed by a much more extensive study. No less than six carefully selected colleges and no less than three successive years in each are necessary to indicate beyond reasonable doubt whether campus agencies have as distinctive and uniform influences as the present preliminary study indicates. Once the relative influence of various campus agencies is established, the enormous investment in liberal education can quickly be made to bear far higher interest in terms of coöperative citizenship and social idealism.

A STUDY OF CONTINUANCE AND DISCONTINUANCE

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Denver Public Schools

IN the spring of 1928 the counselors and principals of the junior and senior high schools in Denver agreed that the research department should make a study of the factors which operate to determine school continuance and grade promotion through the six years of the high-school program of Denver. For purposes of this study it was agreed that a careful record would be kept during the six succeeding years for all pupils who would complete the 6A grade in June, 1928, and that the study would be made by analyzing such records. The limited space here available for reporting this study makes it necessary that the results be summarized very briefly.

SUMMARY STATEMENTS RELATIVE TO STUDY

1. The study began with 856 boys and 865 girls, all of the pupils who finished Grade 6A in June, 1928.

2. Between June, 1928, and June, 1934, 158 of these boys and 139 girls left the city. Since these are losses over which the schools can have little if any control, those pupils are not included in the analyses which follow. That is, all percentages are in terms of the 698 boys and 726 girls who, so far as is shown by the record of the public schools, remained in Denver.

3. Of these 698 boys, 301 or 43.2 percent were graduated in June, 1934. Of the 726 girls, 395 or 54.4 percent were graduated in June, 1934.

4. The number and percentage of boys who were dropped out of the study group for various reasons were as follows:

163 or 23.5 percent were dropped because they failed of promotion. (Of this number 72 were still in school in June, 1934, while 91 had dropped from school.)

67 or 8.7 percent went to work.

41 or 6.0 percent gave no reason for leaving school.

27 or 3.9 percent left no trace.

27 or 3.9 percent went to the Emily Griffith Opportunity School.

19 or 2.7 percent gave "over age" as their reason for dropping from school.

21 or 3.0 percent dropped from school because of serious illness.

18 or 2.6 percent went to non-public schools.

14 or 2.0 percent dropped for other reasons.

The total number of boys who were dropped out of the study for the reasons shown above was 397, or 56.8 percent.

5. The number and percentage of girls who dropped out of the study group for various reasons were as follows:

102 or 14.0 percent were dropped because they had failed of promotion. (Of this number 30 were still in school in June, 1934, while 72 had dropped from school.)

45 or 6.2 percent gave no reason for leaving school.

34 or 4.7 percent gave "over age" as their reason for dropping from school.

29 or 4.0 percent went to non-public schools.

27 or 3.7 percent went to work.

25 or 3.4 percent left no trace.

20 or 2.8 percent dropped school because of serious illness.

23 or 3.2 percent went to the Emily Griffith Opportunity School.

26 or 3.6 percent dropped for other reasons.

The total number of girls who were dropped out of the study for the reasons shown above was 331, or 45.6 percent.

6. The high point of withdrawal from the study was within the period following entrance to the tenth grade and before entrance to the eleventh grade. Of the total losses during the study, 36.1 percent of the boys and 28.9 percent of the girls dropped out within that period.

7. The best record of holding power was made in the eighth grade.

8. The second largest drop-out period was between Grade 8A and Grade 9B. This point marks the completion of the compulsory school attendance period.

9. The percentage of loss as between the junior and senior high schools was higher for girls in the junior high schools and higher for boys in the senior high schools.

10. Intelligence was a definite factor in determining continuation in school.

a. The median I.Q. for those pupils who were graduated was 113.4 for boys and 117.6 for girls as against 104.6 for boys and 105.8 for girls who were dropped from the study.

b. The percentage of boys graduated from each of the four quartiles when grouped according to intelligence quotients were: lowest quartile, 24 percent; second quartile, 45 percent; third quartile, 40 percent; highest quartile, 63 percent.

c. The percentage of girls graduated from each of the four quartiles when grouped according to intelligence quotients were: lowest quartile, 30 percent; second quartile, 51 percent; third quartile, 60 percent; highest quartile, 75 percent.

11. The median intelligence quotient of the 19 boys who left school because they had passed the compulsory school age was 88.3. This is the lowest of the medians for any one of the groups of boys dropped from the study.

12. A pupil's age in relation to the average age at any given grade level was a definite factor in school continuance.

a. The median age at completion of Grade 6A of the pupils who were later graduated was 12-0 for boys and 11-11 for girls while the median age of the pupils who were later dropped from the study was 12-4 for both boys and girls.

b. Of the 301 boys who were graduated, only 11.9 percent were older than 12-11 (Q_3) at the completion of Grade 6A, while 31.7 percent were younger than 11-9 (Q_1).

c. Of the 395 girls who were graduated, only 12.1 percent were older than 12-8 (Q_3) in Grade 6A, while 26.8 percent were younger than 11-7 (Q_1).

d. Of the 27 boys and 21 girls who were fourteen years and eight months of age or older at the completion of Grade 6A, none was graduated in June, 1934.

13. In the case of both boys and girls, failure of promotion appears to have been an important factor in causing withdrawal from school.

a. Of the 163 boys who failed of promotion, 72 or 44.2 percent were still in school in June, 1934, while 91 or 55.8 percent had dropped out of school.

b. Of the 91 drop-outs, 41 advanced an average of 1.8 semesters before permanently withdrawing from school, while 50 dropped out without successfully completing the grade in which they failed.

c. Of the 102 girls who failed of promotion, only 30 or 29.4 percent were still in school in June, 1934, while 72 or 70.6 percent had dropped out of school.

d. Of the 72 drop-outs, 39 made an average advance of 1.7 semesters before permanently withdrawing from school; 33 dropped out without successfully completing the grade in which they failed.

14. Of the 72 boys and 30 girls retained who were still in school at the completion of the study 41 boys or 56.7 percent and 19 girls or 62.1

percent were retained during the six-year period one semester only. All others were retained more than one semester.

15. Of the 67 boys who left school to go to work, only 6 were still in school in June, 1934. A few of the others returned to school for a short time but had again withdrawn before June, 1935.

SUMMARY AND CONCLUSIONS

The relation between intelligence and school continuance is the most important fact revealed by this six-year study of school continuity carried on with this class of pupils.

There may be legitimate doubt as to just what it is that is measured by our so-called intelligence tests. We know that their reliability with many pupils is low. Of one thing, however, there can be no doubt. Normal progression through the ten junior and five senior high schools of Denver for the 1721 boys and girls who completed the sixth grade in June, 1928, was to a high degree dependent upon intelligence, or whatever it is that is measured by the tests which we term *group tests of intelligence*.

For every pupil in the lowest one-fourth of this class in intelligence,[1] who continued with regular promotions through the six years of the high school, there was another pupil in the same lowest one-fourth who dropped from the class and from school because of some factor related to low intelligence. This drop-out was in addition to the drop-out for sickness and other reasons which operated alike with pupils of all levels of intelligence.

The period of time covered by this study, June, 1928, to June, 1934, was a period of great increase in high school enrollments in Denver, as well as in other cities throughout the country. Between these two dates the average daily membership in Grades 10 to 12 in the high schools of Denver increased by 42 percent; in Grades 7 to 9 the increase was 15 percent; while in Grades 1 to 6 the increase was but 2 percent. A similar study for a class that completed the sixth grade at a later date, for example, June, 1931, might give results less striking than those revealed by the present study, but granting that this would be the case, the educational problem of providing a vital program for a great group of pupils for whom the present school program holds little appeal would in no

[1] The term "intelligence" as used throughout this study relates to scores made on the Terman Group Test of Mental Ability which was given at the completion of Grade 6A. The literature on the use and validity of such tests makes it apparent that this is a limited and arbitrary use of the term.

way be solved. That is, it would not be solved unless we believe that school attendance of itself solves all educational problems. Rather, the fact that more pupils than in former years are forced to remain in school because there is no place for them outside of school makes the problem in every way more acute.

There is a great need for a new approach to the problem of providing a challenging curriculum for high school pupils of average and below average intelligence. It is apparent that this need is not met by merely placing such pupils in special sections where they compete only with others of their own kind in the study of the usual curriculum with minor omissions and alterations. Rather, the need is for a curriculum adjusted to the real life needs of such pupils—a program of such a nature that real mastery will be possible for them.[2] Such a curriculum will not be devised by merely cutting out portions of the subject matter included in our present courses in English, social science, mathematics, and other subjects. A new beginning is demanded. We need to examine the types of activities in which such young people engage and will engage without regard to their attendance in high school. We should find other types of activity in which they might be taught to engage with profit and success. We must learn to relate the instruction which the school provides to the furtherance of such activities.

While the foregoing discussion implies that the nature of the school program is such as to discourage continuance in school for pupils of average and below-average intelligence, it does not follow that the school program is alone responsible for this condition. There can be little doubt that the instability of the homes and communities from which many of these pupils come constitute added factors which share in this responsibility. The determination of the share of the total responsibility which may be attributed to each of these three, the school, the home, and the *community,* was not a function of this study.

[2] This does not imply that drastic adjustments are not also needed in the curriculum for average and superior pupils.

THE RESULTS OF ACTIVITY INSTRUCTION: AN INTERPRETATION OF PUBLISHED FINDINGS*

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THE outcomes especially emphasized by activists are at present very difficult to measure. Attitudes of mind and tendencies toward desirable types of conduct, which they take as their primary objectives, are so much harder to evaluate than information and skill, which they take to be of minor importance, that past evaluations of activities have frequently gone no farther than measurement of the minor outcomes and the addition of a pious hope that the major outcomes must have been also attained since they were the object of primary attention in the school. Judging from the rate at which newer types of scales are being produced, such indirect procedure will soon be unnecessary. Results from the present attempts at direct appraisal of the primary objectives of activity instruction, though not numerous, are worth examining briefly.

Creativeness is an objective greatly emphasized. Poems, stories, plays, drawings, musical compositions, are reproduced in successive issues of the journal *Progressive Education*, and in such books as *Creative Expression* (35), *Creative Youth* (38), and *Creative Power* (39). Of the excellence of these samples of children's work there can be little doubt. But they ought to be studied in the future in relation to earlier performance by the same child and in comparison to similar products from conventional schools and in relation to the time and sacrifice of other work (if any) necessary to produce them. Such comparisons apparently are still to be made.

The development of initiative and self-reliance among children—another leading objective—has been evaluated by such means as reports of visitors, by contributions made to projects under way, and by asking children to state all the ways by which they would attempt to find out something they didn't know. The latter plan leads the experimenter to say: "From this study the conclusion is drawn that pupils may be practically independent in their method of attack if the social situation is so set up that suggestions may be freely exchanged as to what is the way to find out answers to questions. This group of pupils [in the fourth grade] suggests most of the ways which any good workman would use." (37) From the use of a careful plan of controlled observation of the

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work of three hundred pupils each in newer-type and standard-type schools, Wrightstone reports: "Seventy-five out of one hundred responses provide for initiative in the newer-type schools, and three out of one hundred responses in standard-type schools." He also states: "Assignment and quiz constitute twenty out of every one hundred teacher activities in class discussion technique in newer-type schools, and ninety-five out of every one hundred teacher activities in class recitation in standard-type schools." He found corresponding differences in the pupils' knowledge of sources of information. (44)

Other desirable outcomes of the activity program, commonly reported by teachers and observers, are that it frees pupils from emotional strain, puts sincerity into their efforts and brings a better understanding between pupils and teacher, develops a feeling of pride in accomplishment, makes for tolerant understanding, develops power to coöperate without destroying individuality, develops a spirit of helpfulness in children, improves their health and social adjustment, and brings parents and children into closer comradeship. (28)

More objective data regarding attitudes are reported by Collings from the McDonald County school under his direction. Here the enrollment increased in a four-year period 30 percent in the activity school as against 5 percent in the two control schools; daily attendance improved 93 percent as against 6 percent; tardiness decreased 92 percent as against 6 percent; truancy decreased 26 percent as against 7 percent; corporal punishment 57 percent against 15 percent; number of pupils remaining to the end of the year improved 78 percent against 2 percent; number of pupils finishing the eighth grade 89 percent against 11 percent; number going on to high school 86 percent against 6 percent. Similar records of number of magazines read in homes, projects carried on during vacations, introduction of better methods of farming, and so on, show how the effects of an activity program spread beyond the schoolroom. Comparable changes in attitude resulting from the use of activity programs are reported by Wrightstone (44) and by Washburne and Raths (25).

Let us turn now to those outcomes in terms of information and skill which, although regarded as minor objectives by the activists, are taken as major objectives by the traditional school, and which happen to be easily measurable. If the activists can beat the traditionalists at their own game, and if the evidence above tends to show that they can attain their own distinctive aims in addition, they are at an advantage. For

their own distinctive aims, whether regarded as of primary importance or not, are at least commonly considered to be desirable. Do pupils, then, in activity schools learn subject matter?

In the study reported by Collings in his *Experiment with a Project Curriculum* (3) we are concerned with a school of the pure activity type where no use was made of the existing course of study, where the school's time was devoted to projects, and where subject matter "received attention only when it contributed genuinely to a more effective realization of the purposes of boys and girls at the time." A check-up made after four years by administering twelve standardized tests in the experimental school and in the two control schools, and pairing 80 pupils as to chronological age, years of schooling, years in the schools of the experiment, and intelligence level, showed that the children of the activity school were superior to those of the control schools in all of the 68 median achievement scores, that their mean score was 138 percent of that in control schools, and that they surpassed the national norms in 57 median scores as against 36 in the control schools.

A later study by the same author (2) compares two junior high schools, one conducted in the conventional book-assignment-and-recitation method and the other again making no use of a course of study but instead employing activities "selected directly from the purposes of boys and girls and under continuous construction through the coöperative efforts of supervisors, teachers and pupils." When 13 standardized tests were given in the two schools and the 64 pupils of the smaller school were matched with 64 of the same age and IQ, it was found that in the seventh grade the average score in the activity school was 86.2 as against 81.5 in the subject-matter school; in the eighth grade 100.1 as against 96.1; and in the ninth grade 107.7 as against 101.8. The experimenter's conclusion is: "Boys and girls do learn some of the materials included in the conventional schools in working out their activities as well or better than boys and girls who study their materials as such in the conventional schools."

Crawford and Gray (4) report that as the result of work on a puppet-show activity a fifth grade class of 108 IQ when given two standardized tests showed about 60 percent more gain in English than was normal for the semester. Their conclusion is: "It is possible to teach through activities and still to accomplish normal or better than normal results in the fundamental skills." In another study using control groups of known IQ and initial achievement level, Crawford and Hale (5) found

that an activity group of 102 average IQ made an average gain of 5.4 months in 2.5 months, according to 10 achievement tests, or 216 percent of normal progress, and that the control group of 110 average IQ gained in this time 5.49 months or 220 percent of normal progress. They conclude: "The results under the activity program were entirely comparable, on the whole, to those under the formal program."

In the experiments with the teaching of arithmetic, Hanna (6) found formal analysis less effective than a self-teaching plan, as did also Benezet (1) and Washburne and Osborne (24). Hizer and Harap (8) demonstrate that activities may be so arranged as to give the pupils practice in all computations in decimals. Harap and Mapes (7), employing activities such as quilt making, a candy sale, a mother's party, and the like, so arranged as to involve fractions and denominate numbers in the computations necessitated by purchasing supplies, found that without the use of any supplementary drills or even of diagnostic tests, and without giving attention to the order of occurrence of the steps in fractions, 37 fifth-grade children of average IQ of 113 on the National Intelligence Tests, learned 84 percent of the processes involved in computations with fractions and 98 percent of the processes involving denominate numbers. One exceptional factor in this experiment was the presence of an unusually good teacher. The authors conclude: "At least under conditions of good teaching, an arithmetic activity program based on real situations in school and in social life incorporating the basic arithmetical steps of a grade may be undertaken with considerable assurance that these steps will be mastered."

After extensive testing in the Lincoln School of Teachers College, Hopkins (9) concludes: "If the Old and New Stanford Achievement Tests are considered valid measures of some of the essentials—an assumption nearer the practice in the subject than in the experimental curriculum—it seems reasonable to conclude that children in the Lincoln School learn these essentials as well as children of like age, grade, and intelligence in the general school population, even though in the Lincoln School such essentials are considered of relatively less importance and are given relatively less attention than in the subject curriculum." Mead and Orth report similar outcomes (16). Hopkins and Mendenhall (10) show that intelligence and achievement tests given through a ten-year period in the Lincoln School reveal the children to maintain approximately the same *achievement quotient* as in subject-matter schools.

Irwin and Marks (12) state that when 35 boys of IQ 100-115 were allowed during their first four years of school life to initiate and largely direct their own activities they fitted into the regular fifth-grade rooms without academic dislocation and were frequently mistaken for the especially gifted children of the school who had IQ's 30 to 40 points higher.

Pistor (18) compared two groups of twenty-nine pupils each, one of which had spent four of its six school years in a "progressive" school, and the other only two years. Controlled observation at two-week intervals for several years showed the former greatly superior in the traits emphasized by Progressives.

Williams (27) reports that when twenty-six of the "worst" boys in a city of 300,000 were placed for a semester in a well-furnished room where they had no instructions except to keep busy and let other people alone, and where encouragement was given to interests showing themselves, they made larger than normal gains on the Stanford Achievement Test.

Shirley and Hevner (20) report a well-controlled experiment in which the project method in a course in laboratory psychology in the University of Minnesota, brings higher scores on objective examinations than the conventional method.

Other investigators consider records made by activity-school pupils when they transfer to conventional elementary schools or are promoted to high school. Thus Meriam (14) in studying about 70 of his graduates found that in independent high schools they made about twice as many high grades as the average pupil and only half as many failures. That this is not to be ascribed to their being children of professors is shown by isolating the comparatively small number who had such parentage and finding that their high school grades are not above that of other children from the same elementary school. In the case of 27 elementary school pupils who transferred to public elementary schools after a year or more in the activity school, he found (15): "The percentage of high grades, E's and S's, is very noticeably greater . . . and the percentage of low grades, I's and F's, is no less conspicuously lower" than the average. These results are confirmed by Fowler (33). Washburne and Raths (25) found that the Winnetka school system, which has an activity program during half the day and an individualized subject-matter program during the other half, sent its graduates to the New Trier High School somewhat better prepared than those from three other villages

of similar social composition. In about 1,200 school marks the Winnetka children had an average standing of 2.16 while those from the conventional elementary schools had an average standing of 2.07. In the extra-curricular activities their record was, naturally enough, still higher.

Unfavorable results of activity instruction are brought to attention with comparative rarity. McCall and others reported from the Horace Mann School of Teachers College in 1919 that children in 'free' rooms were lower than those in 'formal' rooms in eleven of fifteen standardized tests if all the pupils were considered, and in eight of the fifteen tests if only those present during three-fourths of the year were considered (11). Their prediction that the opposite outcome would be found when the teachers became more familiar with the new technique seems to have been well borne out by tests given over a later ten-year period (10). Nash and Phillips find project groups getting lower scores than the control groups in high-school chemistry (17). Melby and Lien find the same outcome in a 7A class in geography (13). Tate, using grades 2A, 4A, and 8A for one semester, found that the project groups made lower scores on objective examinations but stood higher with reference to the so-called intangible outcomes (22). Smith discovered that when an activity program is followed in the elementary school certain subjects such as arithmetic, spelling, and handwriting, are less likely to be employed in the activity than others (21).

Of course not all the experiments above listed are of equal value. Some have too small numbers of pupils, some too short a time interval, some have failed to control all important variables. In this brief review there is not space to criticize each of them. That is to be done by the reader himself with the aid of the appended bibliography. Rather they are discussed here as reports of experiments sufficiently valid to have passed the inspection of editors of technical journals and therefore at least worthy of study.

In attempting to explain the preponderance of evidence indicating the superiority of activity instruction even for traditional outcomes, several possibilities ought to be taken into account.

Perhaps we ought to consider the possibility that an experiment which turns out unsuccessfully is less likely to be written up then if it were successful. The experimenter does not like to present negative results as well as positive, nor does he like to present work which leaves the implication that the failure of the innovation may have been due not only to defects in the new plan but partly to the incompetence of the person

directing it. But these possibilities hardly explain the very small number of reports of negative results (even admitting my own incompetence to locate them all). For the activity movement has had enough vociferous opponents so that by this time an amount of evidence of its inefficiency ought to be produced somewhat comparable to the amount reporting its efficiency.

Another phase of the question worth examining is of course the possibility that amateur experimenters who were directly involved with the success of activity programs may have been inclined to ignore or minimize the less favorable outcomes. But although this may have been true in some of the experiments I have listed, it is not true in all of them. Thus in the studies by Irwin and Marks, Fowler, and Gray, the report was written or checked by outside observers.

Another consideration to be noted is that activity instruction is not necessarily the same as incidental teaching, and does not stand or fall with the evidence accumulated on that older issue. For activities are employed in many different ways,—sometimes indeed in a manner that ignores the course of study, but sometimes as mere motivating devices for subject matter study, and in the latter case sometimes supplemented by drill when a felt need for certain information or skill has been created and sometimes without such supplementation. Although some of the studies here examined claim to have secured subject matter mastery through activities alone, activists are not limited to such a plan. Supplementary drill devices after successful motivation is not ruled out by activity theory and the activists are therefore not restricted to purely incidental teaching.

Another point that ought not to be overlooked is that any type of new school practice is subject to much closer examination than traditional practice. As Dewey points out in *Current History* (July, 1933), a child's failure to learn in a traditional school is usually ascribed to deficiencies in the child, while in a new type of school it is ascribed to deficiencies in the school. Thus a considerable number of failures in activity programs might not show the activity plan necessarily producing any worse results than those accepted as quite normal in the traditional schools.

A final question I have found interesting is why the activity plan, when it is able to produce so much impressive evidence in its favor, advances so slowly toward general acceptance. One finds activity schools reverting to the old type when their directors move to other places, and one finds advocates and apparently successful demonstrators of activity

programs occasionally replaced by more conservative men. Why is this true? Is the turnover higher among activists than among traditionalists? I have seen no comparative statistics. Is the *cost* of an activity program necessarily higher. How much? Are the people of this country, even those who consider activity programs superior to traditional programs, less willing to pay for improved schools than for improved radios, cars, refrigerators, and the like? Is this because they are moved by high-pressure salesmanship in one field and not in the other? If so, what should be done about it? I believe some of these questions would be worth investigating.

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DIAGNOSTIC AND REMEDIAL TEACHING IN FIRST YEAR ALGEBRA

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THE teaching of the more abstract relationships of algebraic symbols presents many problems which are difficult to define. The teacher of first year algebra does not know what errors a student of first year algebra is likely to make, how often the student will make them, or how long the student will persist in making them. The teacher of first year algebra does not possess an accurate method of teaching these abstract relationships. The arithmetic symbols of quantity do not seem so far removed from the things which they represent as do the algebraic symbols of quantity. The expression 4 *apples* in arithmetic seems to be more clear in the mind of the pupil than 4 a in algebra. The number 4 is the same in each instance. But when the term *apples* is removed and the letter a is substituted, the expression loses in concreteness and gains in abstractness. It is probable that this transition does not facilitate the process of teaching how to add the abstract term 4 a to another similar term. However, the immediate problem in teaching first year algebra is not to vaguely philosophize about concreteness and abstractness. It is rather to have the students use terms like 4 a in the variety of situations presented to them in first year algebra. He must add, subtract, multiply, and divide such terms. He must use them in factoring, fractions, and statement problems involving relationships. Above all else, he must be able to handle them skillfully as tools. The problem is to set up the teaching situation in such a manner that the pupil will have a usable knowledge of each process as it is demanded in the more complicated process to follow. It is obvious that any other teaching procedure can only lead to progressive retardation in the learning of algebra.

PROBLEM

If the problem difficulties which a student would encounter in multiplying $3x$ by $2y$ were known in advance by the teacher, a more intelligent effort could be made in teaching the solution to this problem. If the teacher, when teaching factoring, discovers that the students cannot multiply, she is confronted with the problem of teaching multiplication and factoring simultaneously. For example, if a student is required to factor the expression $x^2 - x - 6$ and prove his solution to be correct, he must know both factoring and multiplication. Assuming that the ex-

ample was factored correctly, what are the processes which the student must go through to prove that his solution is correct? The factors of the expression are $x - 3$ and $x + 2$. *First*, the student must know that multiplication is the correct way to prove the solution. *Second*, he must know the form of this multiplication. *Third*, he must know how to multiply correctly x and x. *Fourth*, he must know how to multiply x and $+ 2$ if he is using $x - 3$ as the multiplier. *Fifth*, he must know how to multiply $- 3$ times x. *Sixth*, he must know how to multiply $- 3$ times $+ 2$. *Seventh*, he must know how to add $- 3x$ to $+ 2x$. There are at least seven possibilities of error, any one of which is sufficient to cause an incorrect solution. Of these seven possibilities of error, five of the possibilities are concerned with the fundamental processes of addition and multiplication of monomials.

The problem of this study, broadly stated, is *first*, to learn the nature, frequency, and persistence of the errors in the four fundamental processes; *second*, to learn whether or not these errors are found when the students study the more complicated processes of first year algebra; and *third*, to learn what effect remedial drill to eliminate these errors has on the students' success in solving the more complicated problems in first year algebra.

METHOD OF THE STUDY

The method of this study may be divided conveniently into two parts: *first*, the testing of a random group of students of first year algebra to determine the nature, frequency, and persistence of the errors which they make in the four fundamental processes of addition, subtraction, multiplication, and division of monomials; and *second*, the carrying out of an experiment with a control group using remedial drill procedure to correct the errors to determine the effect of the error correction upon the solution of the more complicated problems of first year algebra.

Tests were made up using the following line of reasoning: it is possible to construct all of the different, simple arithmetical addition combinations by the method of exhausting the possibilities of combining. That is, the number of different addition combinations which can be made by using the ten Arabic numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, two at one time has a definite limit. This possibility of composing, what might be termed complete tests for these number combinations, makes diagnostic work in the field of arithmetic combinations rather definite. It at least makes definite the number of combinations which can be taught.

The huge number of algebraic combinations which could be constructed in the fundamental processes seems to have prevented the attack on this problem by the same method which was used in the attack on the arithmetic combinations. This large number of possible combinations presents two difficulties. *First,* there is the impracticability of teaching all of these combinations. Using the ten Arabic numerals, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, as both coefficients and exponents, the twenty-six letters of the alphabet as literal numbers, and using the positive and negative algebraic signs in all possible combinations, one realizes the enormous number of combinations which can be formed to be added, using two terms at one time. The hugeness of the number of combinations makes for impracticability. *Second,* the difficulty of making up all of these combinations is too great to surmount.

The teacher is thus confronted with a choice of two procedures. He may either use the combinations blindly or he may sample the combinations using certain judgments to help him. Believing that these combinations might be sampled rather compeltely from a logical point if view, the writer has attempted the second of these procedures.

Tests were constructed in each of the four fundamental processes of addition, subtraction, multiplication, and division of monomials. The general plan was to go from the simple to the complex. The first item in the addition test was the addition of a and a. The next item was of the addition of a and b. The third item was the addition of a, a, and b. This plan was followed logically until the test included like literal factors with unit exponents and unit coefficients, unlike literal factors with unit exponents and unit coefficients, like literal factors with coefficients greater than unity and with unit exponents, and unlike literal factors with coefficients greater than unity and with unit exponents. The first 12 items had positive algebraic signs. The items from 12 to 24, inclusive, had negative algebraic signs. The remaining 16 items had the positive and negative algebraic signs mixed.

Administrative difficulties generally prevent including a large number of items. A test consuming more than forty minutes under ordinary school conditions is almost prohibitive. When the tests, as constructed, were first given at the end of the first six weeks of school, the slower students used the full forty minutes for each test. This prevented making the tests extensive enough to include exponents much greater than unity. This handicap had a compensating value in that fewness of the number combinations represented kept down the number of numerical errors.

The same administrative difficulty necessitated using only thirty items in the subtraction test. The addition, multiplication, and division tests each contained forty items.

The tests for subtraction, multiplication, and division were constructed in the same manner as was the test for addition. Items were included to test the students' familiarity with the word terminology, such as, *combine, find the sum of, from a subtract bc, subtract a from 3a, find the product of,* etc. Items were included to test the students' familiarity with the fact that two consecutive parentheses with no algebraic sign between them meant to multiply. Items were included to sample the common kinds of indicated multiplication and division. The tests lay no claim to being complete in testing the students' knowledge of algebraic terminology with the four fundamental processes. The tests merely sampled the kind of material which was being taught.

No attempt was made to establish a reliability coefficient. It is obvious that a student to be successful in first year algebra should be able to solve all items on these test sheets with little or no error. It is not a question of test reliability where each student should make the same score on successive tests.

The purpose of the tests was to make possible the definitions of errors which the students were making immediately after the particular process had been taught. The tests were designed so that they could be repeated by using different literal numbers. In this form they were administered at different times to test for persistency of errors.

The groups tested were random groups as determined by intelligence quotients, departmental algebra tests, rating by eighth grade teachers and the Hotz Algebra Scales.

The 133 students who were subjects in the experiment in the four fundamental operations were given the addition, subtraction, multiplication, and division tests in monomials without warning or coaching immediately after they had been taught these processes with monomials. It was desired to test the students' usable knowledge of these processes. Subject matter prior to the time of giving the first group of tests consisted of the introduction of the students to positive and negative number, some simple equations which could be solved without the aid of positive and negative numbers, some fundamental material dealing with the stating of simple algebraic problems, and the four fundamental processes of addition, subtraction, multiplication, and division of monomials. The first group of tests was given before the students had used

these fundamental processes in more complicated examples. For example, the students had been drilled on examples similar to $2x^2 + 4x^2$, but they had not used this type of example as a portion of an example in long multiplication.

After the students had studied algebra for 12 weeks, they were given the second group of tests. This group of tests was similar to the first group. No remedial work based on the results of the first tests was done in the time interval between the giving of the first and second group of tests. The only difference was that literal numbers m, n, l, o, p, and q were used in the second group of tests instead of the literal numbers a, b, c, d, e, and f which were used in the first group of tests. This was done to aid in eliminating the effect of the first tests coaching the second tests. In addition to the curricular material which the students had studied prior to their first tests, they now had studied the addition, subtraction, multiplication, and division of polynomials, the signs of aggregation, a further list of statement problems, abbreviated multiplication with drill exercises prior to factoring, and a portion of factoring. The students were assigned a regular lesson in factoring for the next day's work. The next day, without warning or coaching, they were given the tests. The aim of this procedure was to test the knowledge which the students had of these processes at that particular time if called on to use this knowledge without review.

The third group of tests was given after the students had studied algebra for 24 weeks. No remedial work based on the first and second tests was done in the time interval between the giving of the second and third group of tests. This group of tests was similar to the first two groups except that the literal numbers x, y, z, r, s, and t were used. In addition to the subject matter which the students had studied when they were given the second group of tests they had now studied all of the factoring, fractions which included reduction to lowest terms, sign changes, reducing improper fractions to mixed expressions, reducing mixed expressions to improper fractions, addition of fractions, subtraction of fractions, multiplication of fractions, division of fractions, fractional equations, a series of statement problems using the fractional process, and graphing of simple equations, with two first degree unknowns. As in the first two groups of tests, this group of tests was given without warning or coaching.

Each group of tests contained 150 items. Each student solved, in the three groups of tests, 450 items. This means that each item in different

form was solved three times by each student. Each group of tests solved by the 133 students produced 19,950 solutions. The three groups of tests produced 59,850 solutions. In order to keep the group of 100 students a random group, the 59,850 solutions were all corrected and substitutions made on the master sheets where they were needed. It was necessary to classify the errors made by 114 students in 50,300 solutions to keep the group of 100 students a random group.

The errors which were actually used in the study were made by the random group of 100 students in solving 45,000 examples. The total of all the errors which were used in the final classification was 8,463.

TABULATING THE ERRORS

Master sheets were used. Errors from each of the 12 tests were entered on separate sheets. The students' names were placed on the master sheets according to where each student's I.Q. placed him in the range from the highest I.Q. in the group to the lowest I.Q. in the group. Three master sheets were made for each of the four fundamental processes of addition, subtraction, multiplication, and division. The students' names were placed in the same position on each sheet. This enabled the writer to trace the persistency of errors directly from the master sheets. Arranging the students by I.Q.'s made possible a comparison of the nature, frequency, and persistency of the errors by different quartiles of I.Q.'s.

Classifying the errors in each of the processes necessitated the construction of a set of categories, or definitions, for each type of error. The test papers from the first tests were studied for different types of errors. The first error in addition that was found which could be defined was defined and placed as the first item in the list of errors in addition. By this procedure, the test papers were searched for different types of errors until the number of different kinds of errors seemed to be exhausted. Literally, this could not be done. However, a large portion of the errors yielded to this method of treatment. Of all errors made, 91.9 percent of the addition errors, 91.9 percent of the subtraction errors, 92.6 per cent of the multiplication errors, and 94.0 percent of the division errors were classified under categories other than numerical and unclassified.

The different categories under which the errors were classified were not without some overlapping. For example, it was difficult to determine whether a student was confusing the algebraic sign rules of addition and subtraction or confusing the two processes. It was thought best in this

case to use the two categories. For the practical purpose of teaching, it would be of value to know that these errors occur. And, if the teacher is not satisfied that these two types of errors are distinct enough to warrant placing them in separate categories, the two categories may easily be combined into one category.

In the solution of examples involving just the fundamental processes of addition, subtraction, multiplication, and division of monomials, there is a possibility of more than one error in each problem. This presents one of the greatest difficulties in the classification of errors. The confusion of two processes in many examples will necessitate two or more errors in the same example if the solution of the example is correct. For example, if it is required to multiply $2x^3$ by $3x^3$, the product will be $6x^6$. If the student does not multiply but adds and adds correctly, the sum will be $5x^3$. If the student is given this example as an example in multiplication and writes the product as $5x^6$, it appears that he has confused the processes of multiplication and addition. That is, the confusion of the processes may mean that the student has confused them merely by interchanging them, or it may mean that he knew how to add exponents but

TABLE I

SUMMARY OF ADDITION ERRORS IN MONOMIALS

Definitions of Addition Errors	6 Weeks' Test				12 Weeks' Test				24 Weeks' Test			
I. Q. Range	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–130
1. Confusing the addition and subtraction processes	9	34	4	4	45	36	0	0	7	15	1	1
2. Confusing the addition and multiplication processes	358	283	117	4	275	226	74	43	203	211	54	17
3. Confusing the algebraic sign rules of the addition and subtraction processes	0	10	5	3	0	5	3	0	0	3	0	0
4. Confusing the algebraic sign rules of addition and multiplication processes	24	38	63	36	28	87	28	9	44	43	13	9
5. Confusing coefficients and exponents	25	36	1	16	0	0	0	0	0	0	0	0
6. Failing to combine like terms in the sum	5	4	7	24	4	15	1	0	0	0	0	0
7. Failing to write the sum in its simplest form	18	18	12	9	0	0	53	0	4	20	1	1
8. Adding coefficients of unlike literal factors	1	24	19	12	25	70	40	7	23	5	2	3
9. Treating an unwritten unit coefficient as 0	0	0	0	0	1	1	3	1	3	0	1	0
10. Adding like literal numbers while disregarding their algebraic signs	5	13	5	7	1	5	0	0	10	0	1	1
11. Numerical errors	2	2	6	3	2	2	3	6	3	3	3	0
12. Unclassified errors	51	51	28	15	26	26	14	8	4	4	4	0
Totals	498*	513	267	133	407	473	219	74	301	316	80	32

*Each total represents the number of errors in 1000 problems made by 25 students each solving 40 problems. One error was recorded for each example solved incorrectly.

did not know that he should multiply coefficients in the process of multiplication. The arbitrary procedure used when confronted with such a situation was to search the test paper for a prevailing error of this type. The test, composed of many items to be solved by the same process, lends itself to this kind of procedure. If no other errors in the test substantiated the hypothesis as first set up, or a different hypothesis tested the same way, the error was recorded as unclassified. If the substantiating evidence was found in the other errors, the error was tabulated accordingly.

To illustrate the procedure used in classifying the errors, four test papers, one from the first group of tests in addition, subtraction, multiplication and division, was selected at random to demonstrate the method

TABLE II

SUMMARY OF SUBTRACTION ERRORS IN MONOMIALS

Definitions of Subtraction Errors	6 Weeks' Test				12 Weeks' Test				24 Weeks' Test			
I. Q. Range	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–130
1. Confusing the addition and subtraction processes	36	6	6	0	8	121	53	24	2	55	38	17
2. Confusing the subtraction and multiplication processes	224	143	41	13	141	101	51	10	129	52	21	14
3. Confusing the subtrahend and minuend	5	10	11	11	5	12	10	9	9	14	8	6
4. Failing to change the algebraic sign of the subtrahend	33	72	32	16	19	68	49	13	54	43	47	1
5. Failing to include the literal factor or factors in the remainder	10	34	15	5	14	31	27	17	5	32	3	0
6. Failing to write the remainder in its simplest form	1	12	7	3	7	16	13	4	0	14	1	0
7. Failing to write the algebraic sign of a negative minuend when the minuend and subtrahend contain unlike literal numbers	0	2	3	0	0	0	1	0	0	0	0	1
8. Proceeding to add by using the original algebraic sign of the subtrahend after the sign had been changed	36	67	15	0	8	28	10	1	2	19	6	2
9. Disregarding literal factors while combining numerical coefficients	21	15	25	12	30	13	14	21	8	13	4	3
10. Numerical errors	1	0	1	0	0	3	0	0	2	1	1	0
11. Unclassified errors	41	61	31	9	24	10	13	3	11	11	6	1
Totals	408*	422	187	69	256	403	241	102	222	254	135	45

*Each total represents the number of errors in 750 problems made by 25 students each solving 30 problems. One error was recorded for each example solved incorrectly.

of classifying. An examination of Plate V, page 213, which contains a test in addition, will show that 30 examples are solved incorrectly. The incorrect solutions of examples 8, 9, 10, 11, 12, 19, 20, 21, 22, 23, 24, 32,

TABLE III

Summary of Multiplication Errors in Monomials

Definitions of Multiplication Errors	6 Weeks' Test				12 Weeks' Test				24 Weeks' Test			
I. Q. Range	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–13
1. Confusing the addition and multiplication processes	78	71	39	5	66	14	8	9	61	35	23	2
2. Confusing the subtraction and multiplication processes	9	12	4	0	0	0	0	0	13	1	0	1
3. Confusing the algebraic sign rules in multiplication	44	19	4	7	31	37	23	8	26	24	30	3
4. Confusing exponents with coefficients	0	2	3	0	0	0	0	0	0	0	0	0
5. Failing to add exponents correctly	9	52	19	7	17	55	5	0	6	12	3	2
6. Failing to write the product in its simplest form	59	64	2	36	14	22	4	8	22	30	0	14
7. Failing to include all of the literal factors of the multiplier and the multiplicand in the product	0	13	0	0	0	15	7	5	0	1	0	0
8. Separating two or more literal factors of the multiplier, or multiplicand, or both, into two or more terms added or subtracted	2	15	9	9	7	12	17	5	0	7	0	0
9. Numerical errors	0	4	0	0	7	0	0	0	0	1	0	0
10. Unclassified errors	8	12	19	4	13	13	10	1	9	1	1	0
Totals	209*	264	99	68	155	168	74	36	137	112	57	22

*Each total represents the number of errors in 1000 problems made by 25 students each solving 40 problems. One error was recorded for each example solved incorrectly.

TABLE IV

Summary of Division Errors in Monomials

Definitions of Division Errors	6 Weeks' Test				12 Weeks' Test				24 Weeks' Test			
I. Q. Range	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–130	71–103	103–110	112–118	118–130
1. Confusing the algebraic sign rules of division	21	35	20	0	56	66	41	1	52	38	37	4
2. Confusing the multiplication and division processes	19	0	0	0	3	0	0	0	0	0	0	0
3. Confusing the subtraction and division processes	20	32	18	0	3	34	5	0	0	2	7	0
4. Confusing exponents with coefficients	0	8	0	0	0	0	0	0	0	0	0	0
5. Failing to subtract exponents correctly	47	4	5	4	36	9	1	3	7	4	0	0
6. Failing to include all of the literal factors in the quotient	0	0	0	0	2	4	1	3	8	5	1	2
7. Dividing a literal factor by itself and getting itself rather than unity	9	57	26	1	33	46	7	5	12	8	4	4
8. Writing the divisor as the quotient	0	4	0	0	0	0	0	0	0	0	0	0
9. Numerical errors	3	6	2	1	2	3	5	0	2	1	4	4
10. Unclassified errors	3	11	0	0	3	6	0	0	1	0	0	0
Totals	122*	157	71	6	138	168	60	12	82	58	53	14

*Error total represents the number of errors in 1000 problems made by 25 students each solving 40 problems. One error was recorded for each example solved incorrectly.

33, 34, 35, 36, 37, 38 and 40 are examples of errors in addition, number 8. This error is defined as the act of adding coefficients of unlike literal factors. It will be noticed that the student did not use any consistency in his regard for signs. In example number 37, the student failed to include any literal factors. Evidently, the coefficients were added correctly with proper recognition of their algebraic signs with no recognition of the fact that two literal factors, a and b, were used in the example. The incorrect solutions of examples 13, 14, 15, 17 and 18 are examples of error in addition, number 4. This error is defined as the act of confusing the algebraic sign rules of the addition and multiplication processes. There is little doubt but that the student was thinking that like signs give plus. The errors in the solutions of examples numbers 25, 27, and 29 are examples of error in addition, number 6. This error is defined as the act of failing to combine like terms in the sum. The errors in the solution of examples numbers 7 and 39 were tabulated as unclassified.

Tables I, II, III, and IV give the complete classification of the errors. The number of errors in proportion to the number of problems attempted is significant. The persistence of certain errors is very important.

At the suggestion of the author, Tucker[1] carried out a controlled experiment at West Frankfort, Illinois, to compare the effectiveness of specific remedial drill exercises with the usual methods of teaching to ascertain the results of the specific remedial drills in solving the more complicated algebraic problems. His general plan was to use the writer's tests to compare the errors of his students with the errors of the writer's students with respect to type and frequency. His remedial work was concerned only with the errors in the four fundamental processes of the addition, subtraction, multiplication and division of monomials.

Tucker gave tests, similar to those of the author's, to 100 students. The author's definitions of errors were used in the error classification. His results were substantially in agreement with the author's results. Tucker's group of 100 students selected at random made 3,247 errors in solving 15,000 problems, or 21.6 percent of error. While there is some lack of uniformity in the frequency of particular errors, the results show a rather high degree of uniformity.

After contrasting his results with the author's Tucker set up a controlled experiment for remedial procedure. He divided the group of

[1]Tucker, Guy E. *The Effects of Specific Remedial Drill in Eliminating Errors in the Fundamental Processes of Addition, Subtraction, Multiplication and Division of Algebraic Monomials.* Unpublished Master of Arts Thesis, Northwestern University, 1930, pp. 80-85.

100 students into an experimental and control group. The following quotation makes clear his technique for selecting students. "During the second week of September, the Otis Classification Test, Form B, was given to each freshman. The median I.Q. of each class was computed after the test papers had been scored by the writer (Tucker). The class medians ranged from 94.38 to 99.53, with the average median for the 12 classes, 97.83. The experimental group was allowed to remain unchanged, and the pupils in the control group were shifted until the I.Q.'s were approximately the same, although slightly higher for the control group. . . . The median I.Q. for the experimental group of 50 students was 97.58; for the control group, 97.50. The range of I.Q.'s was from 77 to 125 in the control group and from 76 to 123 in the experimental group."

Arbitrarily, any student who had more than three errors on any one of the tests was compelled to do remedial drill work. All scoring was objective. All testing and most of the remedial work was done during school hours.

Having tabulated his results, practice sheets very similar to the tests were constructed which were based on the two most frequent errors found in each process. For example, the two most frequent errors in addition in the six weeks' test were confusing the addition and multiplication processes, and confusing the algebraic sign rules of the addition and multiplication processes. Practice sheets were given to the experimental group but not the control group. The aim was to have all factors, except the remedial drill, constant for both groups. Each student in the experimental group was required to solve the problems on his practice sheet with a maximum of 3 errors. The students used a portion of the regular recitation time for this drill work. The errors which the drill was supposed to eliminate were explained to the students. After each student succeeded in reducing his errors on the practice sheets to 3 or less, he was given the test in addition constructed by the author. If he failed to pass with a maximum of 3 errors, he was compelled to do more drill work. If he passed with 3 errors or less, he proceeded as usual. When each student in the experimental group reached this standard, the same procedure was carried out in the subtraction, multiplication, and division of monomials.

Retests were given at the end of 12 weeks and 24 weeks. The arbitrary maximum of 3 errors was used as a standard. Any students failing to reach this standard were given more drill work and retested

until they came up to the required standard. Again, these practice sheets were based on specific errors.

It is significant that, using the arbitrary maximum of 3 errors in the 6, 12, and 24 weeks' tests, there were more than twice as many in the control group of students who exceeded this limit of errors as there were in the experimental group who exceeded this error limit. It is also significant that at the end of 24 weeks no more than 2 students in the experimental group in any single test exceeded the limit of errors. In the control group at the end of 24 weeks, 20 students were exceeding the limit in addition, 22 in subtraction, 21 in multiplication and 12 in division. In fact, there was little significant change in the control group between the twelfth and twenty-fourth weeks. There was a favorable change in addition, a slightly favorable change in division, but a change for the worse in subtraction and multiplication.

These results help one to realize the progressive handicap under which a student works if these errors have not been removed. During the time interval between the 12 weeks' and 24 weeks' tests, the student is constantly working at other complicated algebraic processes which require the use of the fundamental processes as tools. The word *tool* should indicate a finished product.

Perhaps more significant is the demonstrated fact that the errors can be removed in the ordinary teaching situation.

At the close of 4½ months of school, the Hotz Scales, Series B, were given. This series is composed of an addition and subtraction scale, a multiplication and division scale, an equation and formula scale, and a problem scale. It requires forty minutes to give each of these scales. The experimental group had, at the time the scale was given, completed the remedial work for the 6 and 12 weeks. The addition and subtraction scale contained 24 items, 5 of which the students had not been taught. On this test the experimental group solved 686 problems correctly and the control group, 593. The experimental group had a median of 15.14 which represents the problems solved correctly, and the control group had a median of 12. On the multiplication and division scale there were 23 items of which 5 were not valid for the groups. The experimental group solved correctly 662 problems to the control group's 551, or a median of 14.29 for the experimental group and 11.71 for the control group. Of the 25 items in the equation and formula scale, there were 12 of the items that were foreign in type to the two groups of students.

The experimental group solved correctly 430 problems and the control group, 345. This is equal to a median of 9.86 in the experimental group and 8 in the control group. In the problem-solving scale, which consisted of 14 problems, there were 5 of the items that had not been taught. The experimental group solved 297 and the control 239 problems, or medians of 6.5 and 5.13.

At the close of the 30th week of school, the same Hotz Scales, Series B, were repeated, the remedial work for the 24 weeks' period now being completed. Results as to problems solved correctly for the experimental and control groups were: On the addition and subtraction scale, of which one item had not been taught, there were 764 and 628 problems solved correctly with medians of 16.2 and 13.2; on the multiplication and division scale, with 3 items foreign in type, 785 and 603 problems solved correctly with medians of 16.43 and 12.33; on the equation and formula scale, 2 items had not been taught to the students and the experimental group solved 740 items, the control group 567, with medians 15.5 and 12.5; on the problem solving scale, of which the students had not been taught two of the items, the experimental group solved 408 items, the control group 311 items with medians of 8.43 and 6.33 respectively.

It may be concluded then, by the results of the Hotz Scales, that the remedial work has had a distinct value not only in reducing the errors in the four fundamental processes of addition, subtraction, multiplication, and division, but that there is a positive carry-over into the more complicated processes of algebra.

If one reduces to percentages the numbers of problems solved in each of the scale divisions of the Hotz Scales by the control and experimental groups, the gains of the experimental group are made clear. In the addition and subtraction scale, the experimental group had an advantage of 21.7 percent; in the multiplication and division scale the experimental group had an advantage of 30.2 percent. The experimental group in the equation and formula scale had an advantage of 30.5 percent. In the problem solving scale, the advantage in favor of the experimental group was 31.2 percent. These results are little short of remarkable when one considers that the addition, subtraction, multiplication, and division of monomials constitutes a relatively small portion of first year algebra. It is very significant that the major advantage of the experimental group was found in problem solving.

PLATE I

Test in Addition Given after the Students Had Studied Algebra for Six Weeks

ADD:

(1) a a	(2) a b	(3) a a b	(4) a a b c	(5) a b c	(6) a b b c	(7) 2a 3a	(8) 2a 5b	(9) 2a 5a 6b
(10) 3a 3b 4b 2a	(11) 3a 4b 6c	(12) 2a 4a 2b 6c	(13) −a −a	(14) −a −b	(15) −a −a −b	(16) −a −a −b −b	(17) −a −b −c	
(18) −a −b −c −b	(19) −2a −3a	(20) −2a −5b	(21) −2a −5a −6b	(22) −3a −2b −5b −2a	(23) −2a −3b −5c	(24) −2a −5a −3b −5c		
(25) +a +a −b −b	(26) +a −a −a +b	(27) +a −a −b +b	(28) +a −b +c	(29) +a −b +b −c	(30) +a −b −b +c	(31) −a +b +b −c	(32) −5a +2a	
(33) +5a −2a	(34) +5a −3b	(35) +5a +5a −7b	(36) +5a +6a −3b −3b					

(37) Combine: $+7a-5a-6b+3b$
(38) Add: $+5a-6b+3c+2b-6c$
(39) Find the sum of: $6a-3b+4b+7a-3c+2b$
(40) Find the sum of: $4b-6a+2c-3b+4a$

PLATE II

Test in Subtraction Given after the Students Had Studied Algebra for Six Weeks

SUBTRACT:

(1) a a	(2) a b	(3) 9bc 7bc	(4) 2a 2b	(5) 5a 3a	(6) 3a 5a	(7) $4a^3b^3$ $6a^2b^3$	(8) 7a 6b
(9) −a −a	(10) −ab −c	(11) −a −b	(12) −a −bc	(13) −10a − 5a	(14) − 5a −10a	(15) −10a − 5b	
(16) −10ab − 7c	(17) −10a + 7bc	(18) +a −a	(19) −a +a	(20) −a +b	(21) +a −b	(22) +10a − 5a	
(23) + 5a −10a	(24) −10a + 5b	(25) +10a − 5b					

(26) From a, subtract bc:
(27) From $5a$, subtract $-5a$
(28) From $-2b$, subtract $+3a$
(29) Subtract $-a$ from $+3a$
(30) Subtract $+2a$ from $-3b$

PLATE III

Test in Multiplication Given after the Students Had Studied Algebra for Six Weeks

MULTIPLY:

(1) a × a
(2) a × b
(3) ab × a
(4) ab × ab
(5) ab × c
(6) abc × def
(7) 2a × 3a
(8) 2a × 3b

(9) 3ab × 2ab
(10) 2ab × 2c
(11) 2abc × 4def
(12) −a × +a
(13) +a × −b
(14) −ab × +a
(15) +ab × −ab

(16) −ab × +c
(17) −abc × +def
(18) +a × −a
(19) −a × +b
(20) +ab × −a
(21) −ab × +ab
(22) +ab × −c

(23) +abc × −def
(24) −a × −a
(25) −a × −a × −b
(26) −ab × −a
(27) −ab × −ab
(28) −ab × −c
(29) −abc × −def

(30) (−2a) (+5a) =
(31) (−3a) (+3b) =
(32) (−3ab) (+2ab) =
(33) (−3ab) (+2c) =
(34) (−2abc) (+4def) =
(35) +2a.−3a =
(36) +3a.−3b =
(37) −2a.−3a =
(38) −2a (−3b) =
(39) Find the product of: −2 and 3ab
(40) Find the product of: +2c and −3ab

PLATE IV

Test in Division Given after the Students Had Studied Algebra for Six Weeks

DIVISION:

(1) $\frac{a^2}{a} =$
(2) $\frac{ab}{a} =$
(3) $\frac{a}{a^2b} =$
(4) $\frac{a^2b^2}{ab} =$
(5) $\frac{abc}{c} =$
(6) $\frac{abcdef}{bcd} =$

(7) $\frac{6a^2}{2a} =$
(8) $\frac{6ab}{3b} =$
(9) $\frac{6a^2b^2}{2ab} =$
(10) $\frac{6abc}{3c} =$
(11) $\frac{8abcdef}{4def} =$

(12) $\frac{-a^2}{+a} =$
(13) $\frac{-ab}{+b} =$
(14) $\frac{-a^2b}{+a} =$
(15) $\frac{-a^2b}{+ab} =$
(16) $\frac{-abc}{+c} =$

(17) $\frac{-abcdef}{+abc} =$
(18) $\frac{-a^2}{-a} =$
(19) $\frac{-ab}{+a} =$
(20) $\frac{-a^2b}{-b} =$
(21) $\frac{-a^2b}{-ab} =$

(22) $\frac{-abc}{-bc} =$
(23) $\frac{-abcdef}{-bd} =$
(24) $\frac{+a^2}{-a} =$
(25) $\frac{+ab}{-b} =$
(26) $\frac{+a^2b}{-a} =$

(27) $\frac{+a^2b^2}{-ab} =$
(28) $\frac{+abc}{-ab} =$
(29) $\frac{+abcdef}{-abc} =$
(30) −6a ÷ +3a =

(31) −9ab ÷ −3a =
(32) $-ba^2b^2 \div -3ab =$
(33) −6abc ÷ +2c =
(34) −8abcdef ÷ −2abc =
(35) $-6a^2 \div -3a =$
(36) −9ab ÷ +3b =
(37) +9a ÷ −3a =
(38) +6ab ÷ −3b =
(39) −6ab ÷ 2 =
(40) −6abc ÷ +2c =

PLATE V

A Test Paper Taken from the First Test in Addition

Add

(1) a, a → 2a

(2) a, b → a+b

(3) a, a, b → 2a+b

(4) a, a, b, b → 2a+2b

(5) a, b, c → a+b+c

(6) a, b, b, c → a+2b+c

(7)* 2a, 3a → 5+2a

(8)* 2a, 5b → 7a+b

(9)* 2a, 5a, 6b → 13+2a+b

(10)* 3a, 3b, 4b, 2a → 12+2a+2b

(11)* 3a, 4b, 6c → 13+b+c

(12)* 2a, 4a, 2b, 6c → 14a+b+c

(13)* −a, −a, +2a →

(14)* −a, −b → +a+b

(15)* −a, −a, −b → +2a+b

(16) −a, −a, −b, −b → −2a−2b

(17)* −a, −b, −c → −a+b+c

(18)* −a, −b, −b, −c → a+2b+c

(19)* −2a, −5a → −7+2a

(20)* −2a, −5b → 7+a+b

(21)* −2a, −5a, −6b → 13+2a+b

(22)* −3a, −2b, −5b, −2a → −12+2a+2b

(23)* −2a, −3b, −5c → −10a+b+c

(24)* −2a, −5a, −3b, −5c → −15+2a+2b

(25)* +a, −a, −a, +b, −b → +a−a−a+b

(26) +a, +a, −b, −b → +2a−2b

(27)* +a, −a, −b, +b → +a+b−a−b

(28) +a, −b, +c → +a+c−b

(29)* +a, −b, +b, −c → a+b−b−c

(30) +a, −b, −b, +c → a+c−2b

(31) −a, +b, +b, −c → +2b−c−a

(32)* −5a, +2a → −7+2a

(33)* +5a, −2a → +7+2a

(34)* +5a, −3b → +8+a+b

(35)* +5a, +3a, −7b → 12a−b

(36)* +5a, +6a, −3b, −7b → −1+2a−2b

(37)* Combine: +7a−5b−6b+3b. Ans. −1

(38)* Add: +5a−6b+3c+2b−6c. Ans. −2a

(39)* Find the sum of: 6a−3b+4b−3c+2b. Ans. 132a+b+c

(40)* Find the sum of: 4b−6a+2c−3b+4a. Ans. +1c

*Examples solved incorrectly.

REVIEWS

Address all communications relative to book reviews to Editor Kai Jensen, University of Wisconsin, Madison, Wisconsin.

McGRAW, MYRTLE B. *Growth: A Study of Johnny and Jimmy* (New York: D. Appleton—Century Company, 1935), pp. xxi + 319. $3.50.

The genre of this work is indeterminate. The book purports to be a treatise upon growth but lacks the careful documentation and recognition of sources which is the usual characteristic of a scientific monograph. It instructs in the principles of growth, as formulated by experimental embryologists, and in the criteria for determining whether twins are identical or fraternal, but fails to provide the clear-cut comprehensive picture of human ontogenesis requisite of a text in this field. And its terminology is too technical to bid for extensive popular consumption. In brief, the author has written another account of the much publicized twins, Johnny and Jimmy, who were selected originally for a co-twin control experiment because of their supposed monozygotic origin but whose subsequent development and characteristics have indicated mere sibship.

The author's point of departure is that an organism does not develop at the same rates or at the same time in all parts and functions. Hence some patterns of behavior have their inception, development and fixity at birth or before while others appear at later stages. It is generally held that environmental modification is easier in a young organism. The author, following the experimental embryologists, emphasizes the need for noting the age of the behavior pattern or "behavior course" rather than the chronological age of the organism in initiating experiments aimed to alter such behavior. This is an important point deserving the attention of all students of education.

With schedules of development of "behavior-courses" (development of a behavior-pattern from inception to fixity) derived from periodic examinations of a larger group of infants to serve as reference and for comparison, McGraw has sought to determine the effect of use or exercise upon patterns in different degrees of maturity. One of the twins, Johnny, received exercise, while Jimmy presumably had no more and probably had less exercise than did the larger group of infants.

According to the author, the investigated patterns of behavior fall into two classifications: the ontogenetic and the phylogenetic. In the latter group some patterns have an ontogenetic utility and others have none; some attain fixity during prenatal development and persist throughout life, others rapidly disappear: and some have their inception after birth but are none the less phylogenetic in character.

From the patterns which attain fixity prior to birth, the Moro and the grasping reflexes were selected for detailed investigation. According to McGraw the Moro reflex is "rudimentary though highly specific in the newborn," although elsewhere she observes that "many different stimuli will set off the reaction" and that "duration and expansion of the pattern at any

one time is contingent somewhat upon the degree of relaxation and quietude of the infant, as well as upon the strength of the stimulation. Variations in these respects were not subject to experimental control," and "although the pattern is a rudimentary one, it appears at birth not to have attained its maximum development. Ordinarily it is strongest during the second month." It is also asserted that "the somatic reaction is usually accompanied or immediately followed by intense crying," a statement not borne out (except when intense stimuli have been employed) by the investigations of Peiper, Irwin, and the reviewer.

In these experiments on the Moro reflex the stimulus was provided by striking the infant's mattress with a small stick. The reaction time was taken by means of a stop-watch and the experimenter dictated to the recorder the reactions which were observed "in the region of the head and neck, the trunk, upper and lower extremities" including the digits. At various other times motion pictures were taken. The reliability and precision of such observations may be evaluated by referring to Richards and Irwin's study which demonstrated the limitations of the clinical method even when observing *only* the *toe movements* in response to plantar stimulation. That a type pattern of behavior may emerge from a series of such observations is not denied; but such "type" patterns are only scientific fictions and of little significance in an investigation in which the accuracy of discrete, individual observations is of paramount importance.

After the twins were 20 days old Johnny was stimulated 8 times per day, 2 stimulations at 2 hour intervals, over a 9 month period. Jimmy was examined once a week. The results showed "a very high degree of correspondence, and both infants passed through the essential phases as manifested by the other infants under observation" except that Jimmy cried more than did Johnny.

It is pertinent to inquire just how significant are the *known* 39 additional stimulations per week received by Johnny as superimposed upon the contribution of an environment which provided manifold stimuli (e.g., jarring of crib or bassinet, removal of covers, bright lights, and a host of auditory stimuli) of varying intensities for the elicitation of this response in its many forms and gradations. One would suppose that a pattern having great "fixity" would require considerably more exercise to effect modification than patterns not so mature, but analysis of the report reveals, if anything, more exercise in the latter type. As for differences in crying, no norms or range of variability are provided here by which to judge whether the difference is significant.

The grasping reflex, according to McGraw, has two stages: one, the newborn reflex grasp which is of the digital type, and the other, a voluntary and palmar grasp. The first is infra-cortical in its control, the latter cortical. A temporal gap separates the two. Johnny's exercise in this activity did not appear to affect any of the time relations or sequences of development, but he cried less than did Jimmy. Strangely enough no other investigation of the grasping reflex is cited, although one would expect reference to Richter's studies at least.

The postural reactions evoked when an infant is suspended by the feet head-downward were followed from initial patterns of flexion through extension to the mature state of "acquiescence." In this case also, the author reports that the only apparent effect of exercise was to reduce the amount of frequency of crying. No reference is made to other investigations of these response patterns although no

study of the development of such postural reactions can afford to ignore the work of Peiper, of Peiper and Isbert, and of others.

Among those phylogenetic behavior-patterns which have their behavior-courses in post natal life and which are necessary for the normal development and existence, the author studied: crawling and creeping, erect locomotion, sitting and erect postures, reaching-prehensile reactions and reactions to cutaneous irritation.

Prior to the appearance of creeping Johnny was suspended 4 times per day in a jacket-harness which gave complete support but which allowed the hands and knees to touch the underlying surface. With the onset of creeping he was allowed to creep on the floor, while Jimmy was confined to the crib during the clinic hours. Despite this or because of this Jimmy "attained a creeping posture and associated creeping movements a week or ten days younger than Johnny. To what extent training or exercise might have delayed Johnny's development of these patterns we are not at the present time prepared to say." However "during the later period of the creeping stage, it was, so far as the examination periods revealed, difficult to get Jimmy to creep, although he had done so quite readily earlier. It appears that restriction in the use of this performance checked its maximum development, although disuse of the function did not materially alter the fundamental course of growth in the trait, nor did it appreciably affect subsequent development of erect locomotion" (p. 73).

McGraw holds that no one, with the possible exception of Shirley, has traced the development of erect locomotion from the reflex-stepping movements of the newborn. But the author has overlooked events of importance to her specialty. Peiper, an internationally known figure in the field of child development, had studied and photographed these so-called stepping movements and had interpreted their significance before McGraw began her work upon infants. Further, over a decade ago Minkowski (another international authority in child development not so much as cited in this work) had traced the movements in question into the fetal period. Also studies of the character of the step, as revealed by the foot-print technique, from the age of walking on had been made by Wolff.

We note the finding that restriction of Jimmy's walking during the clinic periods showed "that the fundamental sequence of pattern phases in the development of erect locomotion was not altered by repetition of the activitiy or relative restriction in frequency of performance. But the style of walking was influenced by the more extensive use or exercise of the activity" (p. 86).

In acquiring a sitting posture Johnny, despite "exercise," lagged behind Jimmy. The author accounts for this finding in the following manner: "It is beyond the prerogative of this investigation to attribute this retardation in the development of sitting on the part of Johnny to the daily use or exercise which he was at the time receiving. It is the experimenter's opinion that Johnny's failure to attain independent sitting as young as Jimmy is merely additional evidence of his inferior development during the early months. The daily exercise which he had received was insufficient to compensate for his poorer start. The exercise which Johnny received was largely of a passive nature. The experimenter merely took him by the hands and pulled him from supine to an upright position" (p. 93).

Passing to the reaching-prehensile reactions one notes no mention of the significant studies at Yale, particularly those

by Halverson, upon this pattern of behavior nor do we find reference to similar experiments by others. As a result of practice in reaching-prehension in adjusting to a watch in the visual field, Johnny, being in a supine position, did not appear to change any of his developmental sequences. However, Johnny did appear to be superior as a result of practice in the localization of an unseen object upon the chest.

Rotational nystagmus and compensatory movements were studied by the singular and primitive technique of the experimenter's grasping the child and whirling around with him. Under these conditions Jimmy cried more than did Johnny.

Among these complex activities which may or may not be acquired by the individual and which are unnecessary for normal human functioning, McGraw selected the following for investigation: swimming, diving, ascending and descending inclines, getting off stools, skating, coasting on skates, jumping, and manipulation of graded stools and boxes. These activities typically come about as a gradual process of adjusting to various aspects of a situation (i.e., through learning) and consequently the term "exercise" or the term "use" in this connection cannot have the same meaning as when they are applied to the evoking of patterns of behavior present from the start. That the author is unaware of the distinction seems indicated by the following: "We endeavored to arrange laboratory conditions so as to utilize the activities already under the command of the child but to stimulate him to extend his performance beyond that which he had previously accomplished" (p. 122), and "Since these activities are recognized to be under the dominance of the higher structural centers, and since they may or may not be acquired by a given individual, it is extremely pertinent to the study of growth that we ascertain the effect of exercise of activities of this order as compared to the influence of use upon the development of more fundamental phyletic behavior-patterns" (p. 121).

Still further proof of our inability to compare the relative effect of exercise upon phyletic patterns with that upon individually acquired patterns is provided by the admission that there is no way of evaluating the amounts of exercise, for "the complexity of these later performances in which Johnny was trained precluded a routine schedule in terms of time and frequency of stimulation such as had been adhered to in the stimulation of the simpler activities. The total amount of time daily devoted to systematic exercise, after he began to engage in more complicated performances, would approximate three hours a day. The amount of time given to any particular performance could not be even approximately estimated. It has been the writer's experience that in working with infants and young children any attempt to hold time constant is exceedingly inadvisable and misleading. While the writer is highly appreciative of the value of the time factor in making an experiment appear clean-cut, in dealing with infants insistence upon a rigid time schedule introduces an experimental error which far offsets its advantages. The *degree of attention* given by the baby to the situation *is the most important factor involved in the use of a performance*. This factor cannot be evaluated on a time basis" (p. 122) (italics the reviewer's).

It is not within the scope of this review to give in detail the remarkable proficiency developed in Johnny by such training. This portion of the experimental program is of value in emphasizing what can be accomplished by effective training. The possibilities in other ani-

mals had been demonstrated long before it remained for McGraw to show what feats were within the scope of the human young. The development of swimming, although it never progressed to the point of coördination of respiration with natation, seems to prove that infants of the white "race" (Irish-English) may approach those of the natives of New Guinea of whom Margaret Mead says, "Sure-footedness on land and swimming come almost together, so that the charm which is recited over a newly delivered woman says, 'May you not have another child until this one can walk and swim,'" and "Expecting children to swim at three, to climb about like young monkeys even before that age, may look to us like forcing them."

In summing up the work as a whole we may well inquire regarding the objectives of the investigation and whether the nature of the techniques employed made their attainment possible. In the introduction by John Dewey and in the body of the work we are informed that, almost without exception, previous investigations of child development have not been studies of the actual *process* of development but have produced norms of *achievements* only. We are told that studies have all been cross-sectional rather than longitudinal in character. Those ordinarily termed longitudinal are in actuality only a succession of cross-sections and these, while of value, tell little about development *itself* nor do they present the "whole child." Dr. Dewey assures us that by contrast the present study is a true longitudinal research which promises to approach the ideal of revealing the "whole" child.

The reviewer holds that short of *continuous* observation and automatic recording of all activity, all studies must be cross-sectional in nature. They are time samplings of behavior during the life-history of the organism. The pursuit of a particular mode of behavior from time-section to time-section may be described as a longitudinal study but such usage in no way alters the fact that the pursuit is discontinuous, and hence everything observed in a given time-sampling is an "achievement" at the moment regardless of the size of the interval separating the samples. Further, the fact that in McGraw's study the supposed inception, transition and the fixity or disappearance of a behavior-pattern are derived from a study of 68 infants, 42 of whom were still active subjects at the time of writing, and who had an average number of 38 examinations over a period of two years indicates that here is a time-sampling not remarkably different from those employed in studies at Yale, Minnesota, Iowa, and California.

Again, how the "whole" child is to be derived solely from the sequential pursuit of behavior patterns is not apparent. One would suppose that the "whole" child would be represented by the integrated activity found in a given cross-section of the behavior life-history of the individual. If ever a fractionated view of the individual arises, it certainly must come from a disregard of the cross-sectional repertory of the child.

These and other characteristics show that the work is not unique in dealing with the "process" of development. In actuality the author describes a series of "achievements," bridging all gaps by evoking a transitional stage in which now one and now the other sequential form appears. The reviewer believes that further insight into "process" is not to be gained by calling upon the term "transition."

In general the experimental situations and observations are so poorly controlled that no conclusions regarding the comparative effects of exercise upon different types of behavior-patterns are war-

ranted. The writing itself is not always careful, and frequently seems hasty, as may be gathered from the following representative examples. We have been informed in the introduction and in the body of the work that growth and development are synonymous terms and then are confronted by: "Growth of children is so ubiquitous that for thousands and thousands of years it failed to arouse curiosity or to stimulate inquiry as to the nature of its development." Again with respect to the development of behavior patterns we find: "There is a close interdependence in the growth of the various aspects of a pattern. Development works back and forth, yet steadily forward; here and there it strikes rapidly, in other spots it pauses or regresses" (p. 305), or "On the other hand a newly developing aspect of a pattern may herald its forthcoming." It is also disappointing to find a *non sequitur* as broad as the following: "The duration of the response is a better indication of the intensity of their individual reactions than is the reaction-time. Duration of the response also indicates the gradual increase in specificity and narrowing-down of the behavior pattern" (p. 50).

The author advances the "principle of exaggeration" as a fundamental characteristic of development. This alleged principle is applied on the one hand to what most biologists term the generalized responses resulting from irradiation of neural impulses, and on the other, to repetition of a behavior pattern during its acquisition or during its development. The one refers to extensive involvement of the organism in a response, the other to the frequency of a response. It is not apparent that such a concept as the "principle of exaggeration" really adds anything to our knowledge of the process of growth. It is not a biological concept but rather one of evaluation.

In conclusion, the reviewer hazards the judgment that McGraw's work is not an outstanding contribution to our knowledge of the principles of development but that a critical perusal of it will stimulate inquiry into the educational possibilities in early infancy.

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FENDRICK, PAUL. *Visual Characteristics of Poor Readers.* Contributions to Education, No. 656 (New York: Bureau of Publications, Teachers College, Columbia University, 1935), pp. vi + 54. $1.25.

BOND, GUY L. *The Auditory and Speech Characteristics of Poor Readers.* Contributions to Education, No. 657 (New York: Bureau of Publications, Teachers College, Columbia University, 1935), pp. xii + 48. $1.25.

Earlier investigators have nearly always reported that physical disabilities such as eye difficulties, are of distinctly minor importance as determiners of reading efficiency. This view was probably based upon inadequate measurement of visual acuity and other sensory functions. Recently, with the use of more satisfactory measures of physiological handicaps, it has been shown that physical disability may frequently result in reading retardation. The above books, by Fendrick and Bond, present the findings of carefully controlled investigations concerning the part played in reading deficiency by visual and auditory handicaps in first and second grade children.

Fendrick's results show that retarded readers have poorer visual acuity, greater frequency of astigmatic anomalies and

less adequate visual perception than a matched group of good readers. This trend was more prominent with students who were taught reading by the look-and-say method. It was concluded that the visual characteristics of disabled readers should receive definite attention.

In Bond's experiment, performed upon the same matched group of children, it was discovered that retarded readers had poorer auditory acuity and discrimination, and could blend sounds less adequately than the controls. These trends were more prominent for children taught by an oral-phonetic method than for those taught by look-and-say techniques. These two studies suggest that if the method of instruction is adapted to the sensory limitations of the child, he need have little difficulty in learning to read.

In general, both authors are cautious in their conclusions. Nevertheless there are instances where differences of slight statistical significance are emphasized. The unfortunate result of such emphasis is that the uncritical reader is apt to accept and quote the differences as significant. Furthermore, the reader should be cautioned about interpretation of the group trends which point to physiological handicaps among poor readers. In spite of the group trends the data show that many good readers have eye and ear difficulties and many poor readers are without these handicaps. There is sufficient evidence of the effects of physiological handicaps upon reading, however, to warrant a thorough physical examination of visual and auditory reactions of all retarded readers.

One should not assign reading deficiency to any one cause. It may be a visual handicap in one instance and some entirely different determinant in the next. Nevertheless, it is obvious that physiological handicaps are important in some instances. Further research should be done to supplement the suggestive findings in these studies.

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LAY, W. A. *Experimental Pedagogy: With Particular Reference to Education through Activity.* Translated by Adolf Weil and Emanuel K. Schwartz, with an Introduction by Paul R. Radosavljevich (New York: Prentice-Hall Company, 1936), pp. x + 371. $2.25.

Lay's *Experimental Pedagogy* was first published in German in 1907. The present 1936 translation has an introduction of 125 pages written by Paul Radosavljevich of New York University. Lay is characterized as the father of experimental pedagogy and his book as the primer of experimental pedagogy. He favors the didactic, classroom experiment rather than the laboratory experiment advocated by his contemporary, Ernest Meumann. This didactic experimentation included three stages: the preliminary experiment, the real or main experiment, and the control or verifying experiment. Illustrations of Lay's experimentation are found in the fields of spelling, arithmetic, graphic and plastic art of children, and nature study. The book will be of most value to students interested in the history of experimental education, of educational psychology, and of research methods.

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RESEARCH ABSTRACTS and BIBLIOGRAPHIES

Address all communications relative to research abstracts and bibliographies to A. S. Barr, University of Wisconsin, Madison, Wisconsin.

BULLETINS

"Abstract of Doctor's Theses," Bulletin of the Department of Secondary School Principals of the National Education Association, (Danville, Illinois: 132 North Walnut Street, May, 1936), pp. 5-24. Abstracts of Doctor's theses relating to Secondary Education.

"Abstracts of Unpublished Master's Theses," Indiana State Teachers College. *The Teachers College Journal*, VIII (July, 1936), Terre Haute, Indiana, Indiana State Teachers College, pp. 105-135.

Contains a statement of the problem, method of research and findings for masters theses completed at the Indiana State Teachers College for the period August 1935 to June 1936.

BARNES, WALTER. *The Photoplay as Literary Art* (Newark: Educational and Recreational Guides, Inc.) pp. 40.

Contains a discussion of the nature of the photoplay, factors conditioning the photoplay as art, esthetic principles of the photoplay and toward better photoplays. Bibliography.

CARR, WILLIAM G. *A Handbook on Teacher Tenure*. Research Bulletin of the National Education Association, (Washington: Research Division of the National Education Association, 1936), pp. 23.

A bulletin prepared by the Research Division of the National Education Association discussing the reasons for tenure, basic principles, and the present status of tenure in the United States and foreign countries.

CHAMBERLAIN, LEO M., AND MEECE, LEONARD E. *The Local Unit for School Administration in the United States*, Part I, Bulletin of the Bureau of School Service VIII (Lexington, Kentucky: University of Kentucky, 1936), pp. 39.

The author presents a survey of the local unit of school administration in the United States; the number of school units, geographical areas and personal, related factors, the use of various areas as units of school administration, and type forms of organization.

CHAMBERLAIN, LEO M., AND MEECE, LEONARD E. *The Local Unit for School Administration in the United States*—Part II, Bulletin of the Bureau of School Service, VIII (Lexington, Kentucky: University of Kentucky, 1936), pp. 50.

Part II discusses the district, the township, the town, the county, and the state as a basic unit in the local school administration.

CHAMBERLAIN, LEO M., ET AL. *Teachers Retirement Legislation for Kentucky*, Bulletin of the Bureau of School Service, IX (Lexington, Kentucky: College of Education, University of Kentucky), 1936.

The purpose of this bulletin is to present the factual basis for retirement legislation in the state of Kentucky.

CRESSWELL, D. M. (Editor). *Suggestion for Developing Courses of Study in Literature for Secondary Schools,* (Harrisburg, Pennsylvania: Department of Public Instruction, Commonwealth of Pennsylvania, 1935), pp. 99.

Suggestions for developing courses of study in literature for grades 7-12, for different units and purposes of instruction.

GOOD, WARREN R. *An Introduction to Statistics, Emphasizing Application to Education* (Ann Arbor: The Ann Arbor Press, 1936), pp. 43.

A revision of the authors earlier *Elements in Statistics,* intended for students who have had little training in mathematics.

GUTOWSKI, ADRAINA. *Tentative Syllabus in Polish for the Senior High School* (New York: Bureau of Publications, Teachers College, Columbia University, 1936), pp. 24.

A syllabus for the teaching of Polish in senior high schools offering units of work incorporating the essential facts in the life, history, and culture of the Polish people.

HALL, W. F. *The Professional Movement of Rural School Teachers in Pennsylvania* (Pennsylvania State College of Agriculture and Experiment Station, 1936), 64 pp.

After summarizing previous investigations, the author presents the positional history of some 2,118 rural school teachers for a six-year period beginning in the year 1923-1924, with suggestions for the improvement of the personnel of rural students.

HILL, MARJORIE. *Training to Reason,* American Council for Educational Research, Educational Research Series No. 44, (Melbourne, Australia: Melbourne University Press, 1936), pp. 54.

An experimental study of the effect of training to reason from which the author concludes that there is no general increase in ability to reason; the gains are specific and not transferable.

RANKIN, ELIZABETH, AND OTHERS. "Survey of Behavior Traits of Kindergarten Pupils." *Pittsburgh Schools,* X (May-June, 1936), 57 pp.

The committee responsible for this study presents detailed data relative to the changes produced in the bahavior traits of 666 kindergarten children in the Pittsburgh Schools.

SEASHORE, C. E. "Psychology of the Vibrato in Voice and Instrument," University of Iowa Studies, Studies in the Psychology of Music, III (Iowa City: The University Press, 1936), pp. 159.

This bulletin presents an abbreviated summary of previous reports of investigations of the vibrato in voice and instrument carried on in the laboratory for the psychology of music in the University of Iowa.

SEITZ, J. A. *Variability of Examination Results,* Educational Research Series, No. 43 (Melbourne University Press, 1936), 55 pp.

The author presents a statistical analysis of the public examinations of Melbourne.

SMITH, H. L. "Twenty-third Annual Conference on Educational Measurements," Bulletin of the School of Education, Indiana University, VII (September, 1936), 60 pp. Contains discussion on the following:

1. The Conditioned Reflex Technique Applied to a Less Specialized Type of Learning.

2. Measuring Attainment of the So-called General Objectives.

3. The Time Factor in Learning.

4. Language and the Educational Program.

5. The Difficulty of Acquiring a Social Mode of Behavior.

6. Measuring the Budgetary Needs of the School System.

7. Science as a Product of Social Coöperation.

SMITH, RANDOLPH B. *Growth in Personality Adjustment through Mental Hygiene.* An Experimental Study—Child *Development and Parent Education* (Albany, N. Y.: Bureau of New York State Education Department, 1936), pp. 56.

The author presents the results of a study undertaken in New York state to determine whether measurable changes in personality adjustment could be produced in Junior College students through an informal course in mental hygiene. Statistical significant changes were reported.

STERNER, ALICE P., AND BOWDEN, W. PAUL. *A Course of Study on Motion-Picture Appreciation* (Newark, N. J.: Educational and Recreational Guides, Inc.), pp. 63.

The author presents a discussion of the objectives, the content, methods, materials, and appraisal for twelve units of subject matter relating to motion pictures.

SUBLET, FRANK G. *Education for Industry and Citizenship.* Australian Council for Educational Research, Educational Research Series No. 45 (Melbourne University Press, 1936), pp. 132.

The author discusses training for industry and citizenship emphasizing the importance of amplifying the general cultural background of citizens. The specialized training for industry is merely supplementary to the more general cultural training for citizenship.

WITTY, PAUL A. "Intelligence, Its Nature, Development, and Measurement," *Educational Psychology*—(reprint) (Prentice-Hall, Inc., 1936), pp. 55.

The author discusses the historical background of intelligence, its measurement, inheritance of mental ability, constancy of the I.Q., distribution of intelligence, sex differences, race differences, differences in underprivileged groups, the feeble-minded, the gifted and the delinquent. Contains a list of intelligence tests with facts relative to their publication.

WRIGHT, WENDELL W. *Reading Readiness—A Prognostic Study.* Bulletin of the School of Education XII (Bloomington, Indiana: Indiana University, June, 1936), pp. 30.

The author presents data on the predictive value of current measures of reading readiness concluding that few of the measures have predictive value for individuals most of the zero order of coefficients falling below 60; combination of certain measures gave coefficients of correlation of 60 or above and some above 70. Bibliography.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

BILLINGS, N. "Efforts to Evaluate the Milwaukee Teacher-Training Experiment," *Educational Administration*

and Supervision, XII (April, 1936), pp. 260-264.

The author presents the results of an eight year "experiment" in the training of teachers wherein the integrated program of practice teaching reading and discussion is found superior to the traditional course approach.

BREIDENSTINE, A. G. "The Educational Achievement of Pupils in Differentiated and Undifferentiated Groups," *The Journal of Experimental Education*, V (September, 1936), pp. 91-135.

The author presents a detailed study of the effects of differentiated and undifferentiated groups at different grade levels wherein the advantages are found sometimes with differentiated and sometimes with undifferentiated groups.

LACEY, A. E. "The Relative Efficiency of Instruction in Large and Small Classes on Three Ability Levels," *The Journal of Experimental Education*, V (September, 1936), pp. 17-22.

The author reports an experimental study carried on in the Phoenix, Arizona Union High School with large and small classes carried on at three levels of ability did practically as well or exceeded pupils in small classes.

PECK, L. "A Study of the Adjustment Difficulties of a Group of Women Teachers," *The Journal of Educational Psychology*, XXVII (September, 1936), pp. 401-416.

The author presents data upon the adjustment problems of one hundred teachers secured from an application of the Thurstone Personality Schedule. Non-teaching women and men were found to be better adjusted than women teachers.

STROUD, R. B., AND DOUGLASS, H. R. "The Education and Teaching Load of Science Teachers in Minnesota High Schools," *Educational Administration and Supervision*, XXII (September, 1936), pp. 419-426.

The authors present data relative to the education and the teaching load of science teachers in Minnesota high schools.

WOODRING, M. N. "An Evaluation of the Contribution of Secondary Education to the In-Service Training of High-School Teachers during the Last Decade," *Educational Administration and Supervision*, XXII (May, 1936), pp. 331-353.

From replies received from college professors of education courses, state department workers, city superintendents, high school principals, supervisors, and teachers, the author offers an evaluation of present practice in the in-service training of teachers.

PSYCHOLOGY OF LEARNING AND TEACHING

BAYLES, E. E. "An Unemphasized Factor in Current Theories Regarding the Transfer of Training," *The Journal of Educational Psychology*, XXVII (September, 1936), pp. 425-430.

A summary of various theories of transfer and their importance for teaching.

BORAAS, H. O. "An Experimental Study of the Relative Merits of Certain Written Letter Forms with Respect to Legibility, with Speed and Stability as Related Factors," *The Journal of Experimental Education*, V (September, 1936), pp. 65-70.

From a detailed analysis of letter forms, the author shows how handwriting can be improved through the improvement of basic forms.

FARRIS, L. P. "Visual Defects as Factors Influencing Achievement in Reading," *The Journal of Experimental Education*, V (September, 1936), pp. 58-60.

The author presents data on the influence of visual defects on hearing.

GATES, A. G., AND BOND, G. L. "Relation of Handedness, Eye-Sighting and Acuity Dominance to Reading," *The Journal of Educational Psychology*, XXVII (September, 1936), pp. 450-456.

From a study of 65 retarded readers, 65 normal readers, 55 first-grade repeaters and 57 normal first-graders, the authors conclude that there is no consistent tendency for eye dominance, single eye superiority in acuity, hand dominance, or any combination of these to be related to achievement in reading.

HANSEN, J. E. "The Verbal Accompaniment of the Educational Film—The Recorded Voice vs. the Voice of the Classroom Teacher," *The Journal of Experimental Education*, V (September, 1936), pp. 1-6.

From an experimental study of motion pictures with recorded voice and with explanations given by the teacher with some 415 pupils, the author concludes that the explanations can be given as effectively by the teacher.

JAYNE, C. D. "The Integrated Versus the Non-Integrated Use of Moving Pictures in the Classroom," *The Journal of Experimental Education*, V (September, 1936), pp. 7-16.

From an experimental study of 79 sixth grade and 80 ninth grade pupils in the public schools of Stoughton, Wisconsin, the author concludes that children learn much more from films carefully integrated with units of instructions than from non-integrated films.

LAGRONE, TRUDA. "An Analytical Study of the Reading Habits of Deaf Children," *The Journal of Experimental Education*, V (September, 1936), pp. 40-57.

The author presents data indicating differences in the reading habits of deaf and hearing children.

WILSON, G. M., with the cooperation of PORTER, E. R. "In the Useful Fundamentals of Arithmetic Is It Possible to Overcome Temporary Lapses in Ability Leading to Steady Increase in Error?" *The Journal of Experimental Education*, V (September, 1936), pp. 71-78.

The author offers data indicating that the work of pupils indicating inattention and failure can be improved by better methods and curricula.

WITTY, P. A., AND KOPEL, D. "Preventing Reading Disability: The Reading Readiness Factor," *Educational Administration and Supervision*, XXII (September, 1936), pp. 401-418.

The authors present a critical discussion and summary of previous investigations relative to reading readiness with practical suggestions. Bibliography.

YOUNG, W. E. "The Relation of Reading Comprehension and Retention to Hearing Comprehension and Retention," *The Journal of Experimental Education*, V (September, 1936), pp. 30-39.

From an extended experimental study, the author finds evidence that the children's reading difficulties are hearing and language difficulties rather than seeing difficulties.

CURRICULUM CONSTRUCTION

TILLEY, H. C. "A Technique for Determining the Relative Difficulty of Word Meanings among Elementary School Children," *The Journal of Experimental Education*, V (September, 1936), pp. 61-64.

The author offers data on the use of a self-appraisal test for locating difficult word meanings.

WETHERINGTON, JULIA. "Grade Placement of the Content of Arithmetic," *The Elementary School Journal*, XXXVII (September, 1936), pp. 41-46.

The author presents an analysis of the grade placement of arithmetic facts found in ten courses of study judged to be outstanding by the Curriculum Laboratory of Teachers College, Columbia University.

CHILD WELFARE, DEVELOPMENT, AND GUIDANCE

LEARY, GENEVIEVE. "Free Compositions as an Aid to the Teacher in Child Guidance," *The Journal of Experimental Education*, V (September, 1936), pp. 26-29.

The author reports the results of a study of the teacher's use of free compositions as a means of understanding children. The means is found to be effective.

NEWLAND, T. E., AND ACKLEY, W.E. "An Experimental Study of the Effect of Educational Guidance on a Selected Group of High School Sophomores," *The Journal of Experimental Education*, V (September, 1936), pp. 23-25.

The authors offer experimental data indicating that guidance offered to high school sophomores is effective.

THORNDIKE, E. L. "The Value of Reported Likes and Dislikes for Various Experiences and Activities as Indications of Personal Traits," *The Journal of Applied Psychology*," XX (June, 1936), pp. 285-313.

The author presents a statistical analysis of the relationships found in the strong vocational interest blank.

SYMONDS, P. M. "Life Problems and Interests of Adolescents," *The School Review*, XLIV (September, 1936), pp. 506-518.

The author presents data on the ranking of 15 areas of individual concern for interest and seriousness for 373 boys and 439 girls in the junior senior high schools of Tulsa, Oklahoma, and 411 boys and 418 girls in the Grover Cleveland High School, New York City.

MEASUREMENT, STATISTICS AND SCIENTIFIC TECHNIQUE

CASANOVA, T. "Score Transmuter," University of Puerto Rico, San Juan, Puerto Rico, 1935.

The author supplies tables by which scores on teacher-made tests may be rendered comparable.

CRAMER, J. F. "Australian Tests and American Pupils," *The Elementary School Journal*, XXXVII (September, 1936), pp. 17-24.

From a study of the results secured from the administration of 814 Australian reading and arithmetic tests to American children, the author concludes that comparable results are secured—differences, wherever found, arising from differences in organization, curriculum, and teaching methods.

RESEARCH NEWS and COMMUNICATIONS

Address all research news and communications to Carter V. Good, Teachers College, University of Cincinnati, Cincinnati, Ohio.

Secondary School Standards. — Two hundred representative secondary schools in the United States are coöperating this year in the field work of the Coöperative Study of Secondary School Standards. These schools have been carefully selected on nomination of representatives of the six regional associations of colleges and secondary schools which are sponsoring the Study—the New England, Middle States, Southern, North Central, Northwest, and Western Associations. They have been so chosen geographically that every state is represented. They include schools of all sizes, from one of less than than fifty pupils to one with an enrollment of over ten thousand. Included in the group are public and private secondary schools, accredited and non-accredited, conservative and progressive, rural and urban, three-year, four-year, and six-year types, boarding and day schools, and schools for Negroes and Indians.

The most important work of the Coöperative Study this year is the visiting of those two hundred schools by committees of experienced educators who will carefully study and evaluate them. This will be done in accordance with the tentative criteria for evaluation and stimulation of secondary schools which were developed last year by the Study in collaboration with several hundred educators in all parts of the country. Four committees began field work the latter part of September and will be at work continuously until next May visiting these two hundred schools.

In addition to the general visiting program outlined above, ten men worked for a month in September and October, traveling over 25,000 miles in visiting approximately twenty schools each to administer a group of psychological, content, and social attitudes tests to more than twenty thousand high school juniors. These tests will be scored, summarized, and interpreted at the Washington office this year.

The Study, financed by the six regional associations and by a generous grant from one of the national educational foundations, is planned to continue until the summer of 1938. The current year will be devoted largely to field work in the two hundred coöperating secondary schools, while the year 1937-38 will be concerned with the analysis and evaluation of the experimental data, followed by the preparation of recommended practices for consideration and adaptation to the needs of the several regional associations in their respective areas, and the formulation of a final report.

The Washington, D. C., office, which was opened last year, is in charge of W. C. Eells, who is Coördinator of the Study.

Department of Supervisors and Directors of Instruction.—On August 1, 1936, the office of the Department was moved from Teachers College, Columbia Univer-

sity, to the headquarters building of the N. E. A. in Washington, D. C.

The ninth yearbook of the Department, *The Development of a Modern Program in English*, appeared late in October and covers the following topics: the situation as regards English, modern school work in English, the program in action, supervisory problems involved in the development of the program, curriculum revision as a supervisory activity, other practical procedures in solving supervisory problems, the factor of organization, the personality and training of the supervisor of English, research in English teaching, and the challenge of the yearbook program to the average American school system. The Chairman of the Yearbook Committee was Marquis E. Shattuck.

It has been growing more and more evident for some time that the interests of the Society for Curriculum Study are in large measure identical with those of the Department of Supervisors and Directors of Instruction. This was recognized at St. Louis by the appointment of a joint steering committee to undertake the setting up of a commission chosen from the two organizations to prepare a yearbook or special report on the present status of curriculum making in the United States. The plan of the report is substantially that submitted to the Board of Directors of the Department by Paul T. Rankin, Director of Curriculum and Research in Detroit. The Chairman of the Yearbook Committee is Henry Harap. The topics to be covered are: the philosophy of curriculum, recent curriculum trends, social basis of the curriculum, child characteristics and needs, curriculum and course of study, illustrative practices, illustrative curriculums, organization for curriculum construction, and issues in curriculum development. Each of the two organizations will handle the publication of the report for its own constituency. For the members of the Department the report will be issued as the yearbook for 1937. The final chapter on "Issues in Curriculum Development" is to be reprinted as a separate pamphlet for wide distribution at small cost and should prove acceptable to various types of persons engaged in study of the curriculum as part of their general professional preparation or for direct practical use in the field.

Four numbers of *Educational Method* during the present school year will be largely devoted to single subjects. The areas of experience to be treated and the special editors in charge are as follows: "Human Relations," Arthur Henry Moehlman, Ohio State University; "Number," Guy Wilson, Boston University; "Language," Walter Barnes, New York University; "Natural Science," Rose Lammel, Colorado State College of Education. The reconstruction of the curriculum in the common schools is proceeding at so rapid a rate that contributions in these four important fields are sure to be warmly welcomed. The order of publication is: "Social Studies" in December, "Arithmetic" in January, "Language and Composition" in March, and "Natural Science" in May.

Yearbook for 1937.—The Thirty-Sixth Yearbook of the National Society for the Study of Education will comprise two independent volumes. Part I, entitled "The 1936 Yearbook on Reading," has been prepared by a committee of the Society composed of William S. Gray, University of Chicago (Chairman); Jean Betzner, Columbia University; Donald Durrell, Boston University; Arthur I. Gates, Columbia University; Bess Goodykoontz, Office of Education; Ernest Horn, University of Iowa; B. Lamar Johnson, Stephens College; Rollo Lyman, University of Chicago; Paul McKee, Colorado State College of Education;

Vera A. Paul, Whitworth College; Mabel Snedaker, University of Iowa; Willis L. Uhl, University of Washington; and G. A. Yoakam, University of Pittsburgh. This Committee on Reading has enlisted the aid of more than one hundred persons expert on various aspects of reading. Their product will emend and carry forward the pronouncements of the important Twenty-Fourth Yearbook on reading and will undoubtedly be the most authentic and influential handbook on the teaching of reading that has been produced.

Part II, entitled "International Understanding through the Public-School Curriculum," has been prepared under the general direction of a committee of the Society composed of I. L. Kandel, Columbia University (Chairman); W. C. Bagley, Columbia University; Esther C. Brunauer, American Association of University Women; Margaret Kiely, Bridgeport Normal School; D. A. Prescott, Rutgers University; and G. M. Whipple, National Society for the Study of Education. Professor James T. Shotwell, Columbia University, has also been active in bringing this yearbook to completion, especially by enlisting the support of the Carnegie Corporation and of other organizations. Some thirty well-known educators have shown for as many different fields the extent and nature of the contribution that may be found, both in elementary and in secondary education, toward a better understanding of other nations and cultures, and toward the cultivation of better racial and international attitudes.

Nevada Studies.—During the past year, the Nevada Department of Education has been interested in several research projects. A survey was made of crippled children and of feeble-minded or mentally retarded children, in and out of public schools. Surveys were conducted among the schools on the use of visual education; the amount of vocational guidance, formal or informal, conducted in each school; fire prevention equipment, fire drills, and fire hazards in school buildings; the extent of the use of radios in public schools; and the content, texts, etc., of physical education classes in elementary and high schools, both rural and urban. Studies have been made of salary schedules in rural schools and in larger schools, and of the salaries of principals and superintendents in all sizes of Nevada schools. Much time and effort have been expended on statistics concerning the retirement system now in use in Nevada. Work is under way on a new library list for elementary school reading. Statistics are being compiled on transportation in Nevada. The Department is building up a small library of schoolhouse plans, specifications, etc., for the information of districts which are contemplating new buildings or remodeling.

Illinois Projects.—Research projects and statistical studies are rapidly coming to the front in the office of the Superintendent of Public Instruction. Studies recently completed have brought further interesting results in regard to qualifications and salaries of different groups of teachers and administrators. Investigation of per capita cost in one-room schools in Illinois, as well as in other types of elementary schools, have been made. Per capita cost studies in two-, three-, and four-year high schools have aroused considerable interest. Charts of average daily attendance, claims for state aid, and the effect of irregular attendance upon such aid have been made for the State by counties.

In the field of finance, statistical accounting studies have been made, which are now a part of a resultant uniform Non-High School Claim for Tuition

Blank as well as of a reorganized accounting system for township school treasurers (based upon the separate levies for educational and building fund purposes.) An investigation is now in progress which gives the complete financial picture of each high school in the State as regards valuation, present financial conditions, and evident present and future needs.

The office is at present studying and gradually formulating a uniform system of accounting for the elementary and secondary schools of the State. It will be keyed in with the forms used in reports by township treasurers, county superintendents of schools, and non-high school boards of education.

The most thorough and far-reaching investigation of school conditions ever made in Illinois is well under way with the title, "Study of Local School Units," and should be practically completed by March, 1937. This study, financed by the Federal government, and under the direction of State Superintendent Wieland of Illinois, is resulting in a series of maps showing the location of all children of school age, location of school buildings, number of grades and teachers in each building, type of school organization, present district boundary lines, roads, and transportation routes. This information is scientifically placed on three different maps in order that all details may stand out without confusion. In conjunction with these maps, there are charts, graphs, and reports for each county which show the financial condition of each district and the physical equipment, both interior and exterior, of each school building. Reports also cover buildings and grounds. Teacher-pupil load, per capita cost, and derivative data of numerous types are combined in the report. It is planned that with the completion of the project a complete county report including charts and maps will be available for all counties. This study is intended to give a complete picture, without bias, of the school situation in Illinois as it actually exists, for the use of those interested in better educational opportunity for school children.

This information was provided by E. L. Coberly, Director of Research and Statistics.

Philadelphia Schools, 1935-36.—Progress in the Philadelphia system is summarized under seven headings by Philip A. Boyer, Director of Educational Research: age-grade survey, enrollments, promotions, ability adjustments, class size, individual pupil records, and measured results. In 1936 the pupils averaged less than one-half year above standard age per grade, whereas ten years ago they averaged one year over age. During the past two years, enrollment in the first six grades has decreased 5.8 percent and increased 8.1 percent in grades 9 to 12, making a reduction in total enrollment of 1.3 percent. Promotion rates in the elementary school are 95.7 percent; junior high school, 95 percent; and senior high school, 86 percent.

The testing program reveals significant advances, especially at the elementary level. Objective test results show that, in the year just passed, elementary schools reached a high point of achievement. A comprehensive battery of tests in reading and related working skills (Map, Table, and Graph Reading, Outlining, Use of Index, and Use of Dictionary) was administered throughout the elementary grades in October, 1935, and again in May, 1936. The results of these tests show significant progress in pupil attainment, not only when measured in terms of average scores, but also in the percents of relatively poor readers in each grade.

The Philadelphia program in teaching the fundamental operations of arithmetic is characterized by regular early-term diagnoses of pupil performance, analyses of difficulty by both pupil and teacher, and individualized practice and drill made available in the Philadelphia Practice Exercises in Arithmetic. Test results in fundamental operations of arithmetic continue to show levels of performance which are above national norms. Tests in problem solving were administered in eight grade-sections in December, 1935, and in six grade-sections in March, 1936. The results in December indicated a gain over the results in December, 1933, and 1934. Comparison of the results in March, 1936, with those in March, 1930, 1933, 1934, and 1935 shows that the 1936 city average score was higher than that of any previous March.

Within the senior high schools, reading tests serve especially the function of providing a basis for the adjustment of reading assignments. In some cases the results suggest the desirability of adjustment teaching which may require the organization of special remedial classes or of special groups within regular classes. Reading scores in secondary schools are also of value as providing measures of general ability to do school work. Early term diagnostic tests in American history, chemistry and pre-geometry provide teachers with a prompt analysis of the abilities of pupils in order that instruction may be adjusted. Standardized tests, developed by the Coöperative Test Service of the American Council on Education, have been administered in various subjects to representative groups of pupils in the junior and senior high schools during the year. Results of these tests are not sufficiently extensive to be conclusive. Nevertheless, in some schools, they point to relatively low levels of attainment in Latin, to average levels in general mathematics, geometry, history, biology, Spanish, and French, and to high levels of attainment in physics.

West Virginia Studies.—The Research Division of the State Department of Education of West Virginia has recently compiled the first part of a study of the building needs of the fifty-five county school systems of the state. The specific purpose of this study was to project a school building program based upon the reorganization of local school attendance units. There were prepared for each county school system: (1) a map showing the location of school buildings and grades actually taught in each building, the enrollment and the number of pupils transported, the all-weather and other roads, rivers, creeks, railroads, towns, cities, and county school district-boundaries; (2) a detailed statement of the proposed community school centers, indicating the schools to be abandoned, the number of pupils and teachers in the proposed schools, and the schools that must remain isolated until more all-weather roads are built; (3) a summary of the preceding data, showing in tabular form the names of school centers, the number of pupils, and the number of teachers in the proposed reorganization; (4) a statement by size and cost of the buildings needed to put the proposed changes into immediate effect; (5) an alphabetical list of every school in the county, showing whether it is retained or abandoned, and if abandoned, the name of the school to which the pupils are to be transported for their elementary, junior high, and senior high school training.

At the time of the survey the elementary school pupils of the state were housed in 3,886 one-teacher schools, 777 two-teacher schools, 496 with three to five

teachers, 220 with six to eight teachers, and 211 with nine or more teachers, totaling 5,590 schools. The reorganization summary totals 2,618 schools consisting of 1,755 with one teacher, 197 with two teachers, 192 with three to five, 188 with six to eight, and 286 with nine or more teachers. Similar changes were recommended in the organization of high schools: 17 one to four-teacher schools instead of 86, 46 five to nine-teacher schools instead of 135, 59 ten to fifteen-teacher schools in place of 80, and 105 instead of 68 schools with sixteen or more teachers, a total of 227 high schools to replace the 369 operating at that time.

The reorganization would necessitate the outlay of approximately $10,775,000 for new buildings. The total operating costs of the schools, however, would be reduced two million dollars annually, occasioned by reductions mostly in personnel. Added transportation costs were considered in making the estimate. The reorganization would pay for itself in about six years.

The second part of the survey, which has been approved as a Works Progress Administration project under the supervision of the State Department of Education, will be started soon. The investigation will be concerned with school building types, conditions, and replacement needs because of obsolescence.

The director of Research is Richard E. Hyde.

Maine Curriculum Innovation.—The Maine State Department of Education has had a committee of school men and women, representing the state department, teacher-training institutions, elementary school supervisors and superintendents of schools working on a comprehensive course of study in temperance to be used in the public schools of the state. A great deal of time and research have gone into the preparation of this curriculum. The committee has now completed its assignment and the course will be ready for distribution before the new year.

The problem of temperance is treated from a new angle, namely, that of applying the principles of temperance to all phases of living. The course is entitled, "The Science of Living," which implies good citizenship and the necessity for practicing total abstinence from all things harmful, and moderation in all phases of human activity. The uses and abuses of alcohol, and the effect of narcotic drugs and tobacco upon the human system, are given careful consideration. The main objective is to develop correct habits, right attitudes, and clear thinking on the part of the school pupils which will lead them to become masters of themselves, through which mastery real contentment and happiness in life may be attained. It has been the intent of the committee to approach the teaching of scientific living through the use of existing curricular activities, with a minimum of emphasis upon the addition of special teaching time for the presentation of such a course. It is believed that the approach described above is psychological in character and should prove correspondingly effective.

Yale Clinic.—Recent and current researches of the Yale Clinic of Child Development include the following studies:

The normative researches reported in the volume on *Infant Behavior: Its Genesis and Growth* (By Gesell and Thompson) are being continued by means of follow-up studies of the original group of normative infants. About three-quarters of the infants have been examined either at 5 or at 6 years of age. It is proposed to re-examine them at the age of 10 years. Helen Thompson is making special studies

of the anthropometric development and anthropometric indices of the normative infants.

Henry M. Halverson is continuing studies of developmental changes and complications of the early grasping response, measuring the strength of its components under variable conditions of contact and pressure. He is also investigating the symptoms of bodily tension revealed in the early grasping response at feeding periods and between feeding periods. He has developed a new double exposure method of photographing the infant's head and a measuring scale whereby it will be possible to analyze growth changes in the cranial and facial contour during the first year of life.

Gesell and Halverson in collaboration have completed an investigation of "The Development of Thumb Opposition in the Human Infant." The investigation was based on detailed cinema analysis of systematic cinema records. A scientific film portraying the findings of this study has been prepared.

Catherine Strunk Amatruda is making studies of bodily and behavior development of mongols during infancy and later childhood.

Gesell has made a nationwide survey of the incidence of clinical mongolism in colored races and reports a new case in an article, "Clinical Mongolism in Colored Races: With a Report of a Case of Negro Mongolism," published in the *Journal of the American Medical Association*, CVI (April 4, 1936), 1146-50.

Gesell in collaboration with Frances L. Ilg, research pediatrist, have been making studies of the development of feeding behavior.

Gesell and Amatruda, with the assistance of Culotta, have just completed a detailed investigation of "The Mental and Physical Effects of Thyroid Substance on the Cretinous Infant." This study is based on periodic developmental examinations, consecutive cinema records, and repeated physical measurements.

Gesell and Eugene M. Blake have made a joint report of the instance of a remarkable duplication of bilateral coloboma in a pair of twin girls. The report includes a survey of the literature on ocular correspondence and ocular pathology in twins.

Ruth W. Washburn is making a study of the play life of children as observed in the nursery unit, supplemented by information concerning play activities as ascertained by parental interviews. She is continuing follow-up studies on the psychological development of smiling and laughing.

Helen Howard has completed a minor investigation on the different types of contact by nursery school children.

Burton M. Castner is making further studies of reading disability with special reference to its early diagnosis in the preschool years. He has completed a paper on "The Incidence of Certain Sinistral Types among Children Referred to a Guidance Clinic."

Louise B. Ames has completed an investigation of "The Sequential Patterning of Prone Progression in the Human Infant." The study is based on cinema records and on longitudinal and periodic observations.

Pearl F. Gridley has completed a study of "Graphic Representation in its Nascent Phases at Four Years of Age."

Members of the Staff of the Clinic have contributed to the Dodge Memorial volume with the following studies: A. Gesell, "Some Observations of Developmental Stability;" H. Thompson, "Sleep Requirements During Infancy;" R. W. Washburne, "A Study of the Activity Patterns of Preschool Children;" and H.

M. Halverson, "Complications of the Early Grasping Reactions."

Research on Reading and Language.—Two recent bulletins of the National Conference on Research in Elementary School English are entitled, "Research Problems in Reading in the Elementary School," and "Bibliography of Unpublished Studies in Elementary School English, 1925-1934." Copies are obtainable at a nominal cost from C. C. Certain, North End Station, Detroit, Michigan.

Oakland Studies. — Recent bulletins from the Oakland, California, Public Schools report the results of studies of class size, holding power, teacher absence, mental tests, and reading tests.

Guidance in Missouri.—Twelve guidance groups in the larger high schools of the state have been organized under the supervision of the State Department of Public Schools. It is planned to publish the results of this guidance project during the summer of 1937.

Follow-up of Denver High School Graduates.—A report of the Bureau of Business and Social Research of the School of Commerce of the University of Denver entitled, "A Survey of Denver High School Graduates," states that: (1) out of the 5,010 pupils graduated from the classes of 1929, 1933, and 1934, nearly 40 percent entered college; (2) of the 5,010 graduates as of April 1, 1935, about 2,000 are gainfully employed; (3) of the 1929 graduating classes, 24 percent of the boys and 38 percent of the girls are married; (4) the chief recreation interests are baseball, tennis, and golf; (5) in property holdings, the automobile stands at the head of the list for boys—in general, the radio ranks second for both boys and girls.

Needed Studies in South Dakota.—R. W. Kraushaar, State High School Supervisor, has prepared in mimeographed form a list of educational topics for investigation in South Dakota.

Michigan Testing Program.—Bulletin No. 148, 1936, of the Bureau of Educational Reference and Research, University of Michigan, by Clifford Woody, reports the results secured from testing 12,878 sophomore pupils in 176 Michigan high schools. The information presented is concerned with levels of achievement, selective power of various courses and activities, college intentions, vocational choices, mental scores in relation to size of school and family, and suggested studies for the school principals.

Australian Council for Educational Research.—An international conference on education will be held in Australia in the summer of 1937 under the auspices of the Council, with sessions scheduled in the principal cities. Many of the speakers will come to Australia after having spoken in New Zealand.

Since 1930 the Council has subsidized 124 investigations at a total cost of 13,558 pounds, and has published some 50 reports.

The Council has a Committee on Secondary Education, with a number of subcommittees which have been organized to discuss the various school subjects. Each of these smaller committees is to draw up a statement of the principles considered important in determining the content and method of each subject or group of subjects at the secondary level.

In addition to its arithmetic tests, which have been used rather extensively in Australia (with the results in print), the Council has published tests in reading, chemistry, and spelling. Two intelligence tests, one verbal and the other non-verbal,

have been applied and norms will be available within the near future.

New Zealand Council.—The first annual report of the New Zealand Council for Educational Research covers the period 1934-35. The studies supported by the Council are concerned with educational and vocational guidance, centralization of control in education, rural education, effects of schooling, and standardization of intelligence tests.

Slater Fund.—The annual report of the John F. Slater Fund for the year ending June 30, 1935, includes a summary of the amounts distributed by and through the Fund from 1882 to 1935: to religious and private institutions, $2,491,891, and to public schools, $1,707,933, a total of $4,199,824.

Rockefeller Foundation.—The annual report of the Rockefeller Foundation for 1935 covers the work done in international health, medical sciences, natural sciences, social sciences, the humanities, and in China. Disbursements for the year totaled $12,725,439.34.

The Psychometric Society.—A group of psychologists interested in quantitative psychological problems has organized the Psychometric Society, which was affiliated with the American Psychological Association at the Ann Arbor meeting in September, 1935. The primary objective of the Society is to promote the development of psychology as a quantitative rational science. This concept of quantification involves more than fitting of empirical curves to experimental data. It involves the formulation of hypotheses in mathematical form, their development into a consistent quantitative psychological theory, and quantitative tests of the agreement between theory and the experimental data.

Psychometrika, the official journal of the Society, appears quarterly. The journal contains articles on the following subjects, with emphasis on the first: (1) the development of quantitative rationale for the solution of psychological problems; (2) new mathematical and statistical techniques for the evaluation of psychological data; (3) aids in the application of statistical techniques, such as nomographs, tables, work-sheet layouts, forms, and apparatus; (4) critiques or reviews of significant studies involving the use of quantitative techniques; and (5) general theoretical articles on quantitative methodology in the social and biological sciences.

Paul Horst, of Proctor and Gamble Co., Cincinnati, is editor-in-chief of *Psychometrika*, and L. L. Thurstone of the University of Chicago is president of the Society.

Among the Journals.—Carl Murchison has resigned his professorship at Clark University to devote all his time to the five psychological journals with which he is connected. The new editorial and publication offices are at Provincetown, Massachusetts.

With the first number of the fifth volume in September, the *Journal of Experimental Education* made its appearance in print form rather than lithoprint, with the publication office changed from Ann Arbor, Michigan, to Madison, Wisconsin.

Conferences and Meetings.—An international conference on population problems will be held in Paris, July 28-31, 1937, under the auspices of the International Union for the Scientific Study of Population Problems.

Ned H. Dearborn and Harvey Zorbaugh of New York University have available a proposal for the Educational Exhibit of

the New York World's Fair (1939), and desire criticisms of it from individuals and educational organizations.

A group of eighteen organizations representing every important phase of American education has arranged the first National Conference on Educational Broadcasting in Washington, D. C., on December 10, 11, and 12, 1936. The Conference will be held in coöperation with the United States Office of Education and the Federal Communications Commission. The purpose of the meeting is to enable the large number of persons who are interested in educational broadcasting to discuss means by which radio may become a more effective instrument for education, both formal and informal; to serve as a clearing house for information on the latest technical and professional developments in educational broadcasting; and to enable persons representing all phases of the subject to become acquainted and to exchange ideas and experience. The program will include such topics as schools of the air, radio music, speech, drama, religious broadcasts, forums on the air, organization of listening groups, radio workshops, writing for radio, broadcasting to schools, use of radio programs by colleges and universities, use of radio by libraries and museums, developing use of electrical transcriptions for education, radio programs for children, problems of research in educational broadcasting, organizing audiences for radio programs, educational broadcasting in other countries, audience attitudes, exchange of programs for educational purposes, and organizing the community on behalf of a radio station. C. S. Marsh of the American Council on Education, 744 Jackson Place, Washington, D. C., is acting as Executive Secretary for the planning committee.

School administrators and teachers from twenty-nine states attended the Seventh Annual School Administrators' Conference held at George Peabody College for Teachers, June 11, 12, and 13, sponsored by the department of school administration at Peabody with Dennis H. Cooke and Ray L. Hamon in active charge. The general conference theme was "Administering the Instructional Program to Meet the Needs of Pupils." The proceedings of the Conference are available in a printed volume.

Section I (Psychology) of the A. A. A. S. will meet in Atlantic City from Monday, December 28, to Wednesday, December 30. In addition to the usual program of contributed papers, there will be, on Wednesday, a symposium on *The Cortex and Behavior*, under the chairmanship of Leonard Carmichael, University of Rochester.